NARROMINE SHIRE COUNCIL

NARROMINE RIVER BANK LEVEE FEASIBILITY STUDY

VOLUME 2 - FIGURES

DECEMBER 2013

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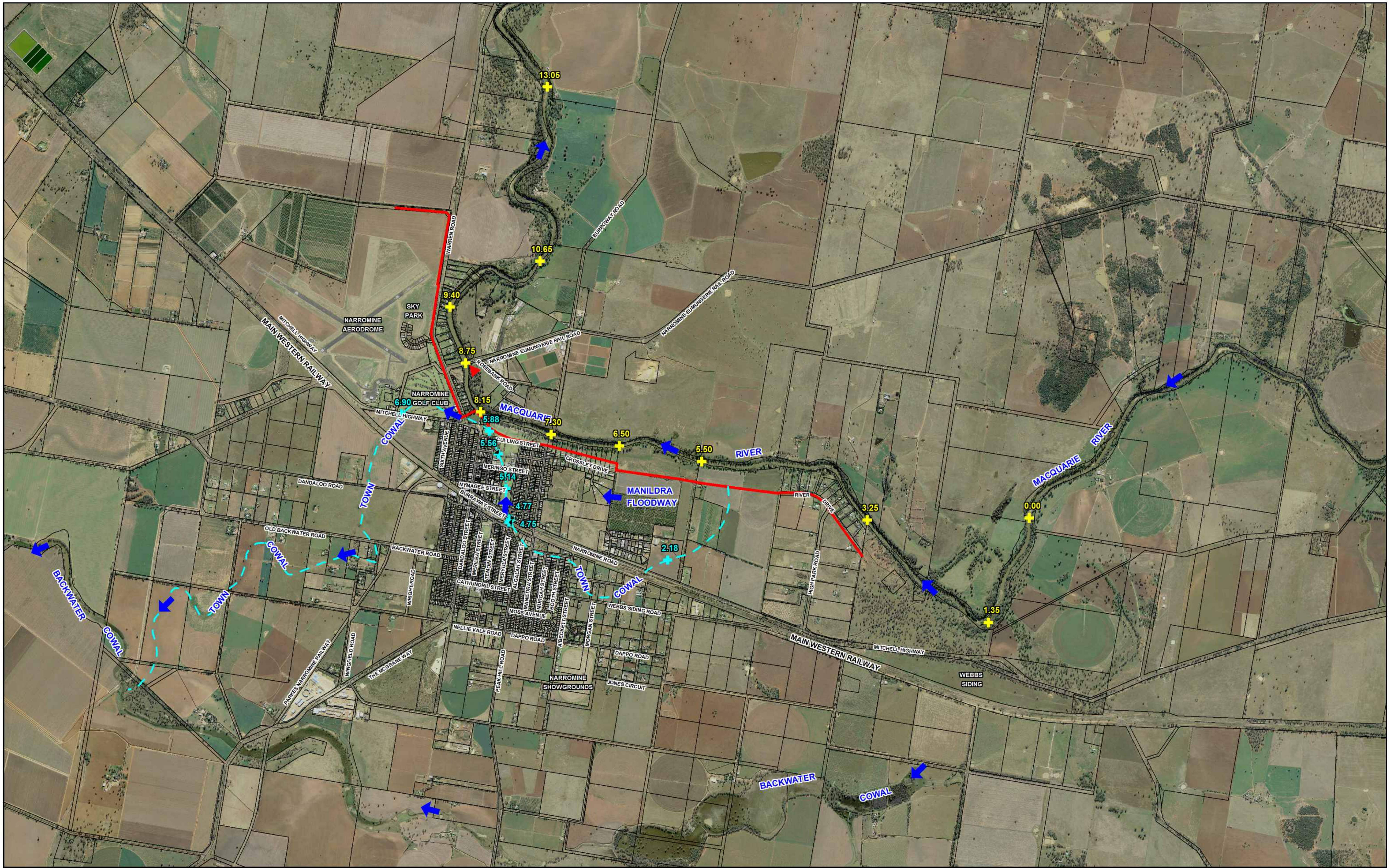
LIST OF FIGURES



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Scale: 1:40,000

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LEGEND

Alignment of Preferred Levee Route 2A(i)

Narromine Flood Gauge (GS 421006)

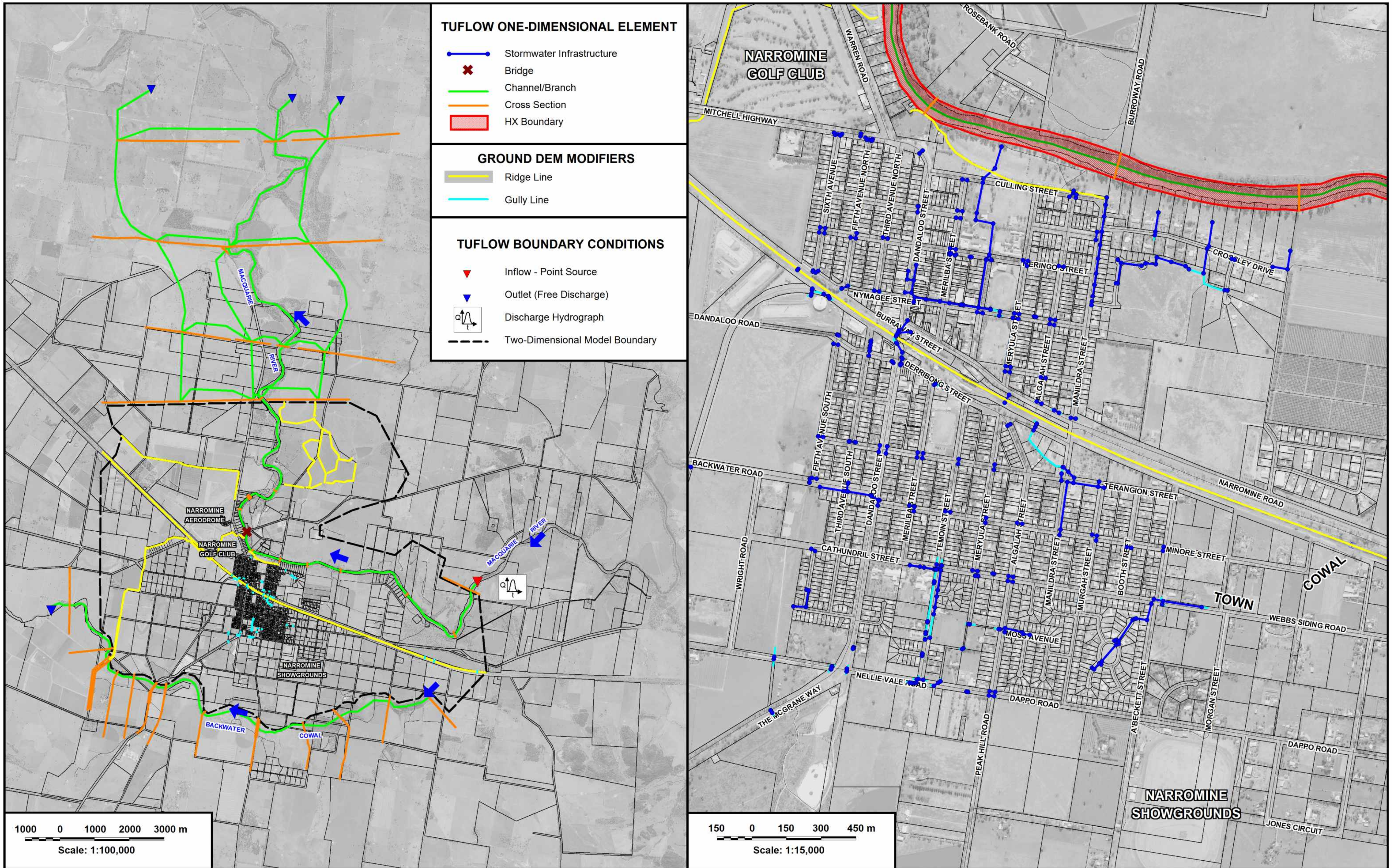
7.30 MIKE 11 River Chainage (Macquarie River)

6.90 MIKE 11 River Chainage (Town Cowal)

NARROMINE RIVER BANK LEVEE FEASIBILITY STUDY

Figure 1.1

LOCATION PLAN



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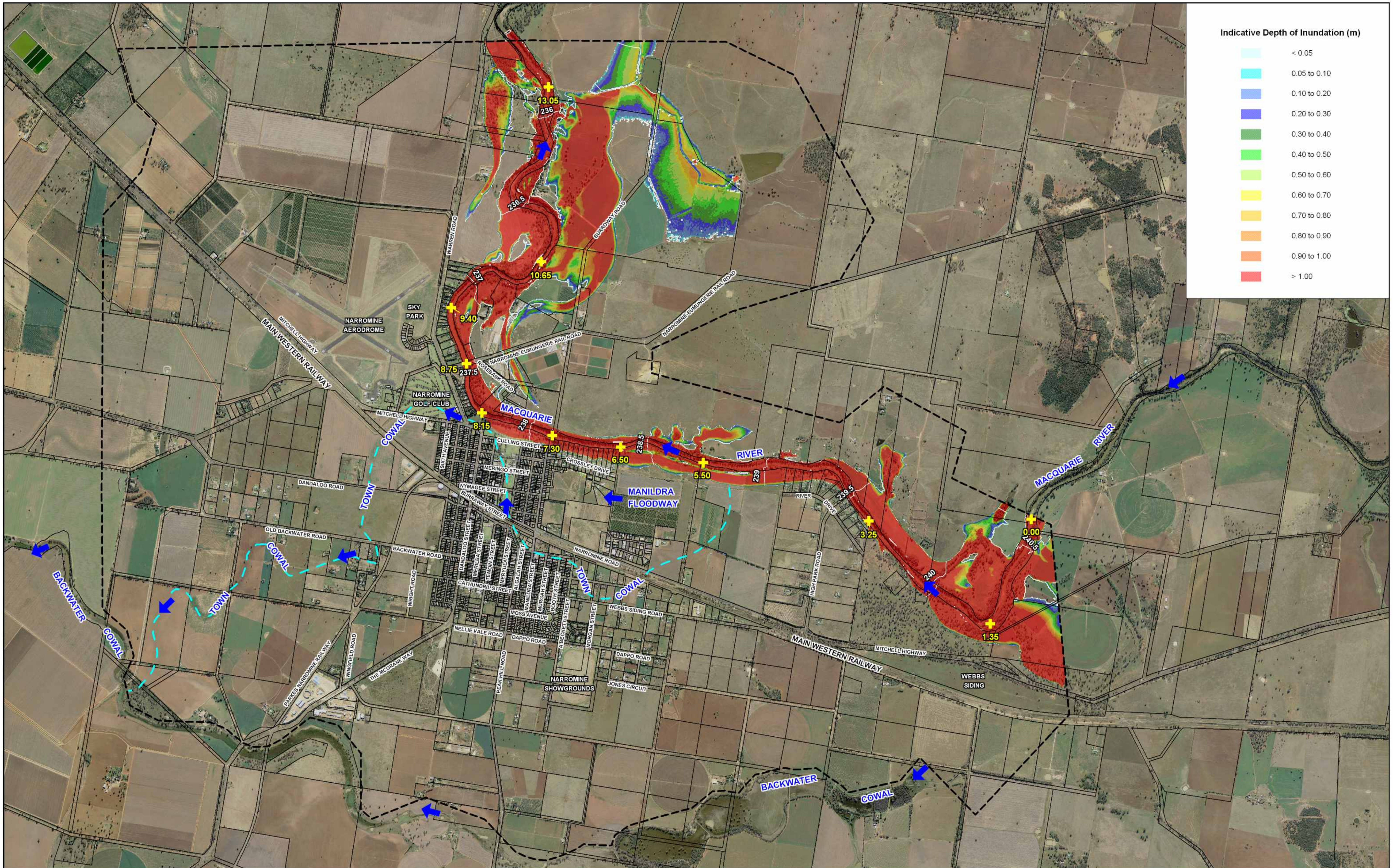
NARROMINE RIVER BANK LEVEE FEASIBILITY STUDY

Figure 2.1

TUFLOW MODEL LAYOUT



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Scale: 1:40,000

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NOTE:

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LEGEND

Two-Dimensional Model Boundary

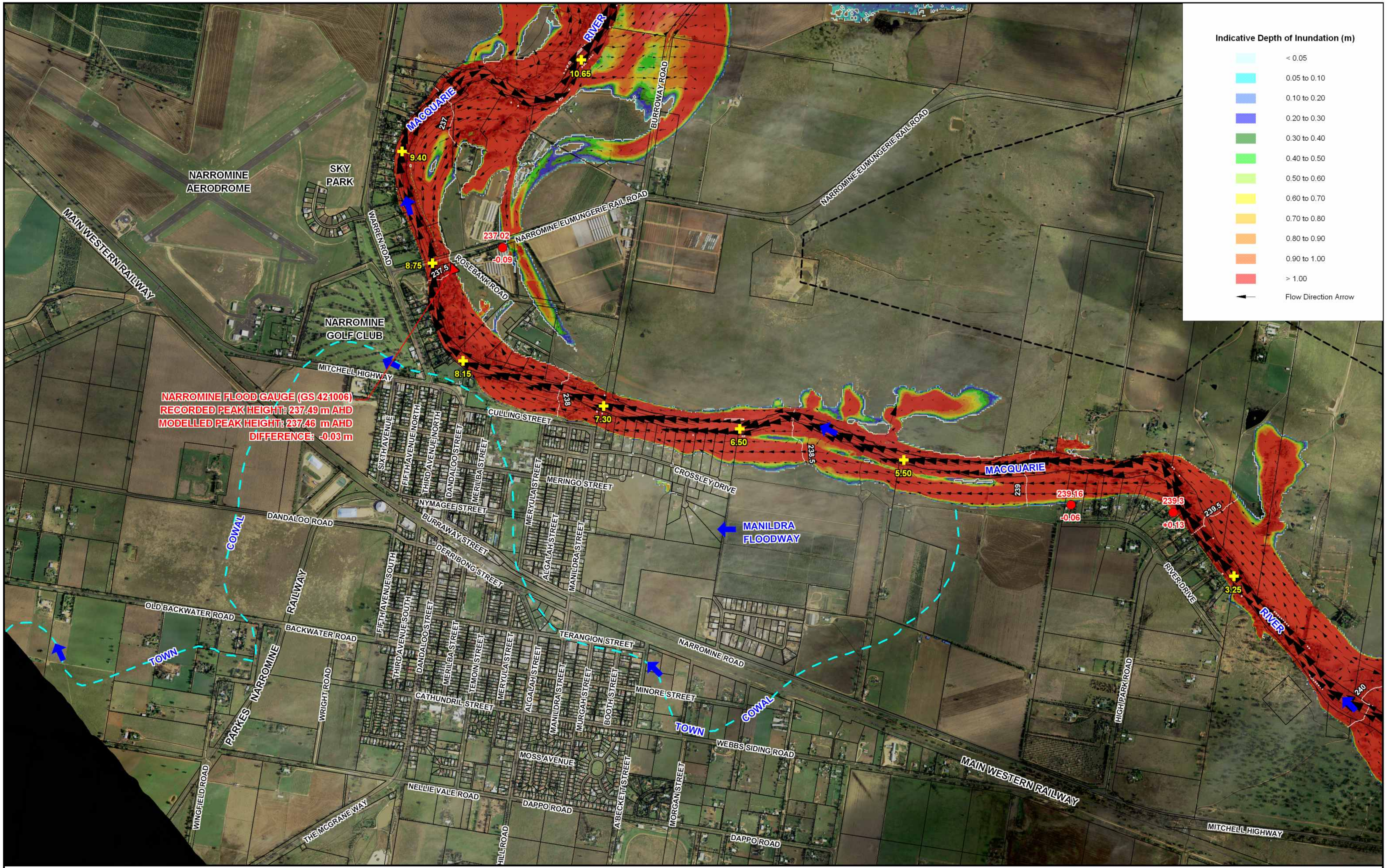
7.30 MIKE 11 River Chainage

237 Water Surface Elevation (m AHD)

NARROMINE RIVER BANK LEVEE FEASIBILITY STUDY

Figure 2.3
(Sheet 1 of 2)

TUFLOW MODEL RESULTS
AUGUST 1990 FLOOD



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Scale: 1:20,000

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LEGEND

Two-Dimensional Model Boundary

Surveyed August 1990 Flood Mark (m AHD)

Difference (Modelled Minus Recorded Levels (m))

(Source of Flood Marks: Bewsher, 1998)

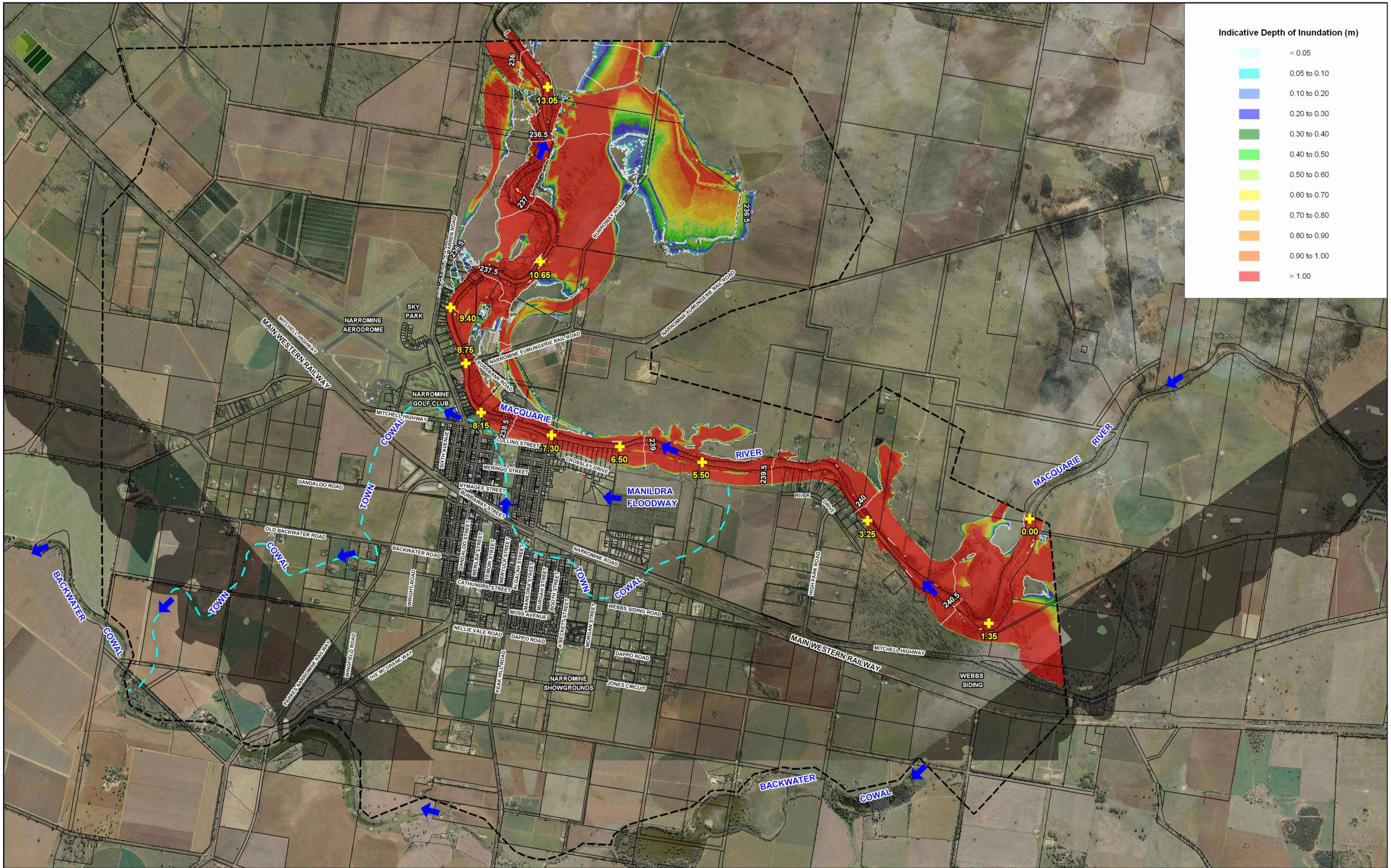
MIKE 11 River Chainage

Water Surface Elevation (m AHD)

NARROMINE RIVER BANK LEVEE FEASIBILITY STUDY

Figure 2.3
(Sheet 2 of 2)

TUFLOW MODEL RESULTS
AUGUST 1990 FLOOD



N

400 0 400 800 1200 m

Scale: 1:40,000

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LEGEND

Two-Dimensional Model Boundary

7.30 MIKE 11 River Chainage

236.5 Water Surface Elevation (m AHD)

NARROMINE RIVER BANK LEVEE
FEASIBILITY STUDY

Figure 2.4
(Sheet 1 of 2)

TUFLOW MODEL RESULTS
DECEMBER 2010 FLOOD

N

200 0 200 400 600 m

Scale: 1:20,000

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LEGEND

Two-Dimensional Model Boundary

238.64 / +0.08 — Surveyed December 2010 Flood Mark (m AHD); Difference (Modelled Minus Recorded Levels (m)) (Source of Flood Marks: NSW SES)

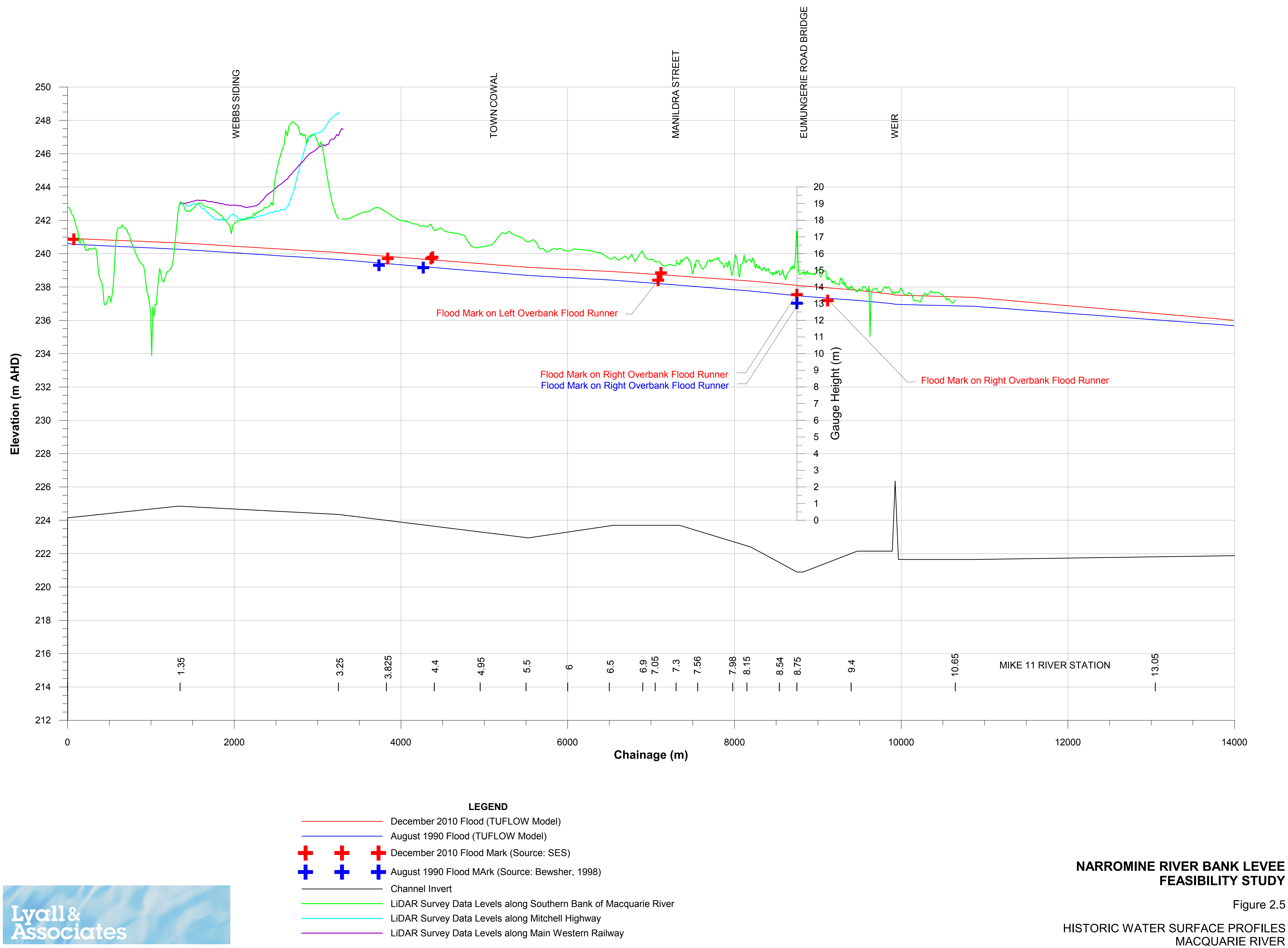
7.30 — MIKE 11 River Chainage

240 — Water Surface Elevation (m AHD)

NARROMINE RIVER BANK LEVEE FEASIBILITY STUDY

Figure 2.4
(Sheet 2 of 2)

TUFLOW MODEL RESULTS
DECEMBER 2010 FLOOD



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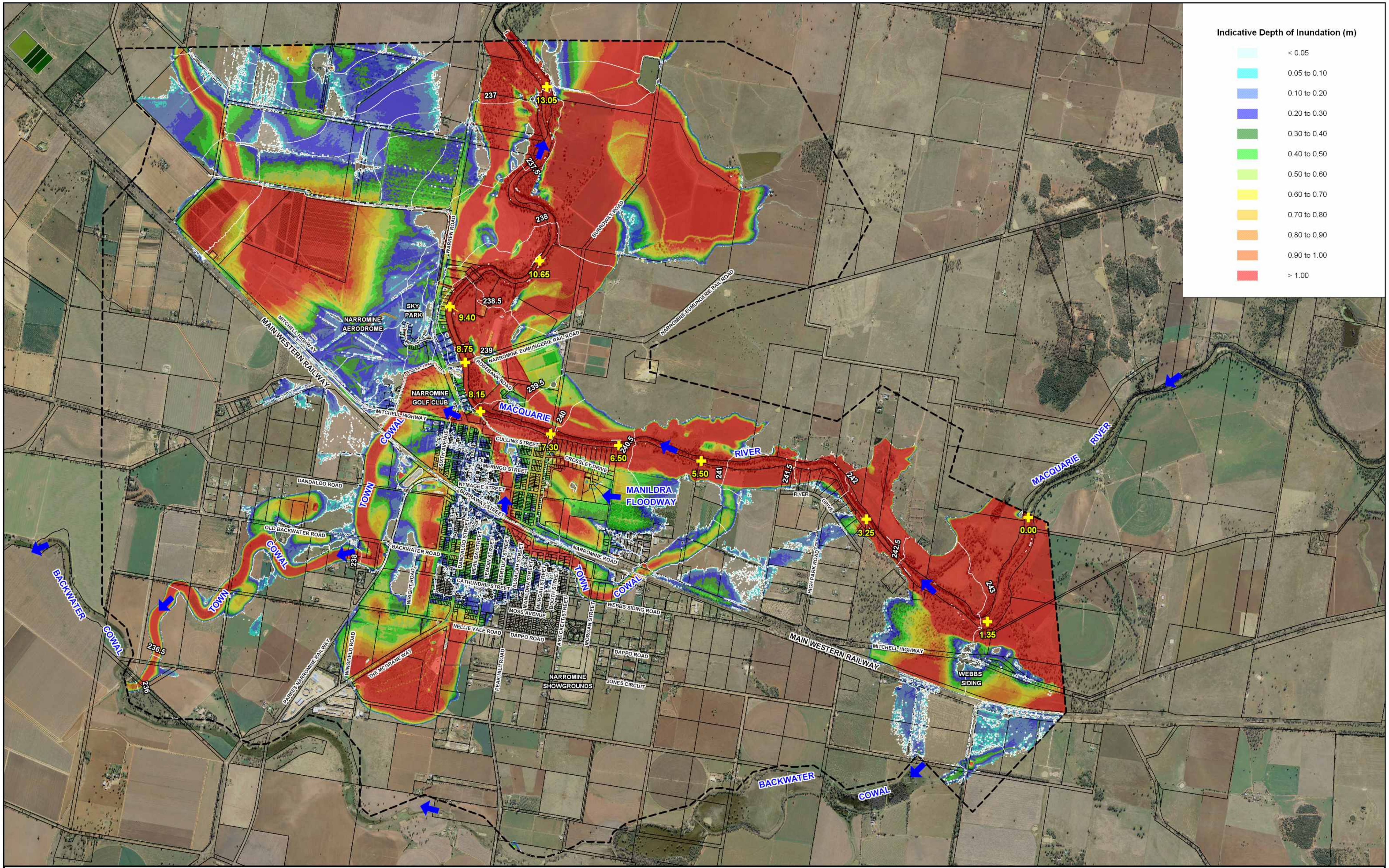
NARROMINE RIVER BANK LEVEE FEASIBILITY STUDY

Figure 2.5

HISTORIC WATER SURFACE PROFILES
MACQUARIE RIVER



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Scale: 1:40,000

LEGEND

Two-Dimensional Model Boundary

237 Water Surface Elevation (m AHD)

7.30 MIKE 11 River Chainage (Macquarie River)

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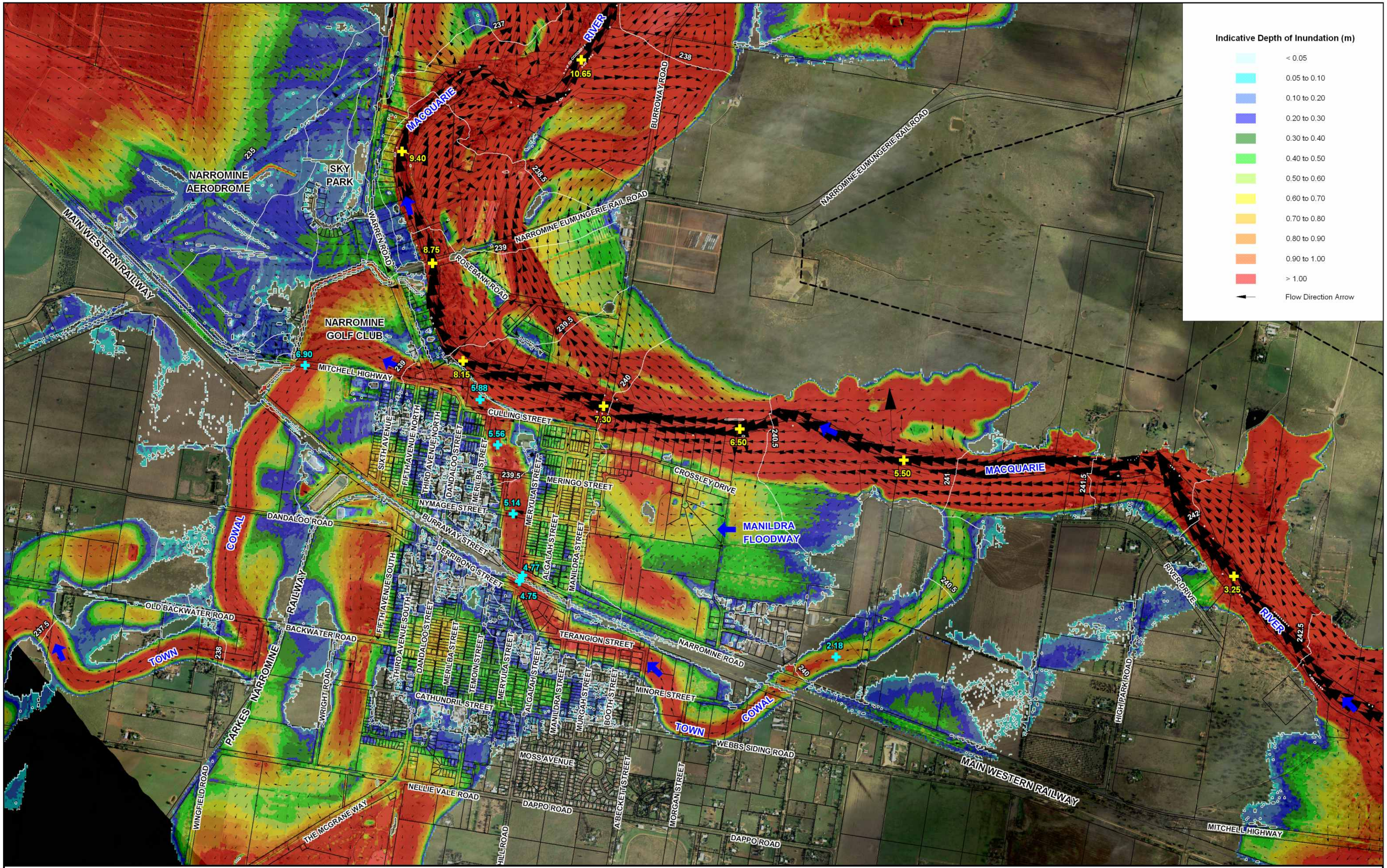
NARROMINE RIVER BANK LEVEE
FEASIBILITY STUDY

Figure 3.1
(Sheet 1 of 2)

TUFLOW MODEL RESULTS
1% AEP (BEST ESTIMATE HYDRAULIC ROUGHNESS VALUES)



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Scale: 1:20,000

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LEGEND

Two-Dimensional Model Boundary	
238.5 Water Surface Elevation (m AHD)	
7.30 MIKE 11 River Chainage (Macquarie River)	
6.90 MIKE 11 River Chainage (Town Cowal)	

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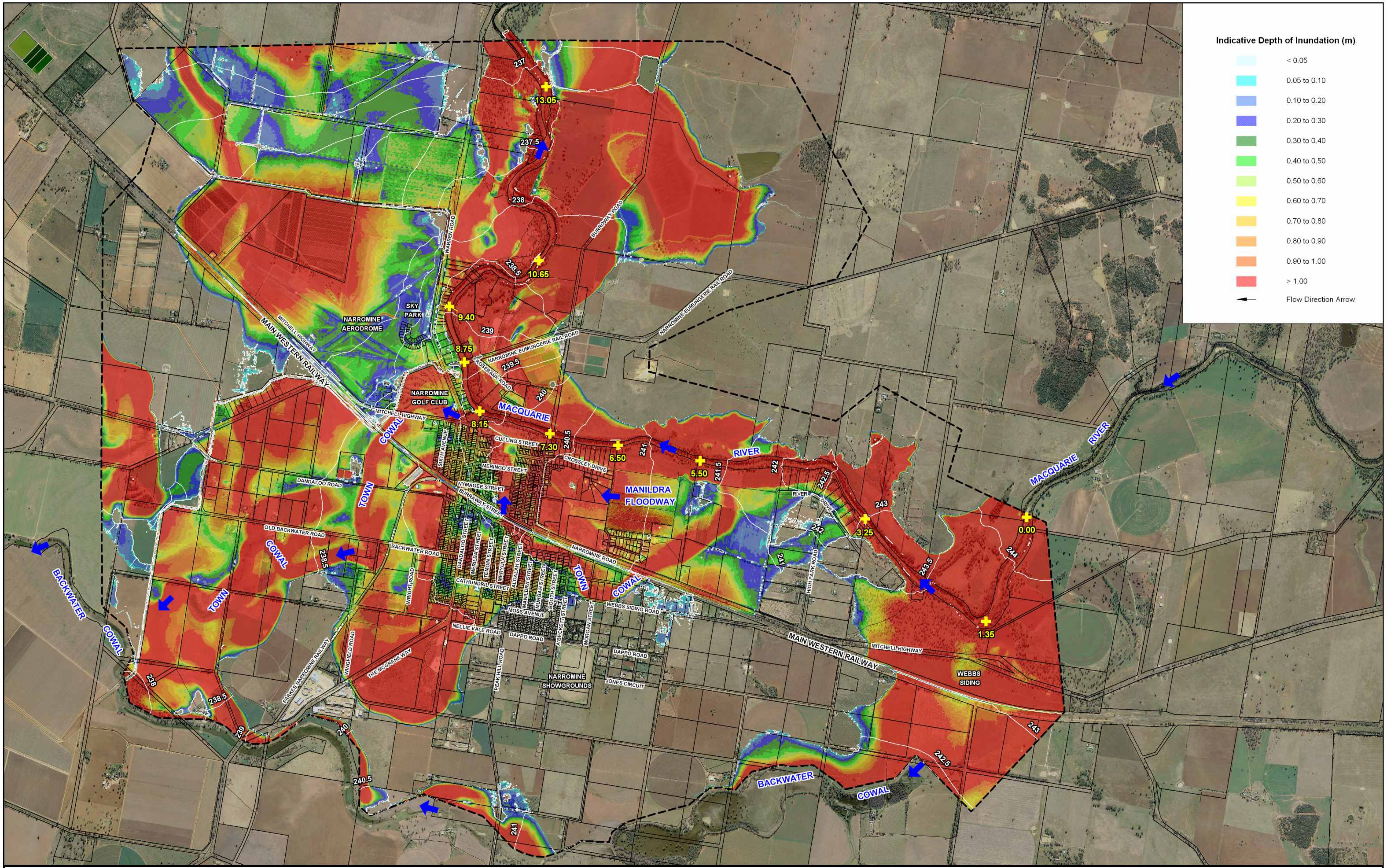
NARROMINE RIVER BANK LEVEE FEASIBILITY STUDY

Figure 3.1
(Sheet 2 of 2)

TUFLOW MODEL RESULTS
1% AEP (BEST ESTIMATE HYDRAULIC ROUGHNESS VALUES)



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400 0 400 800 1200 m

Scale: 1:40,000

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LEGEND

Two-Dimensional Model Boundary

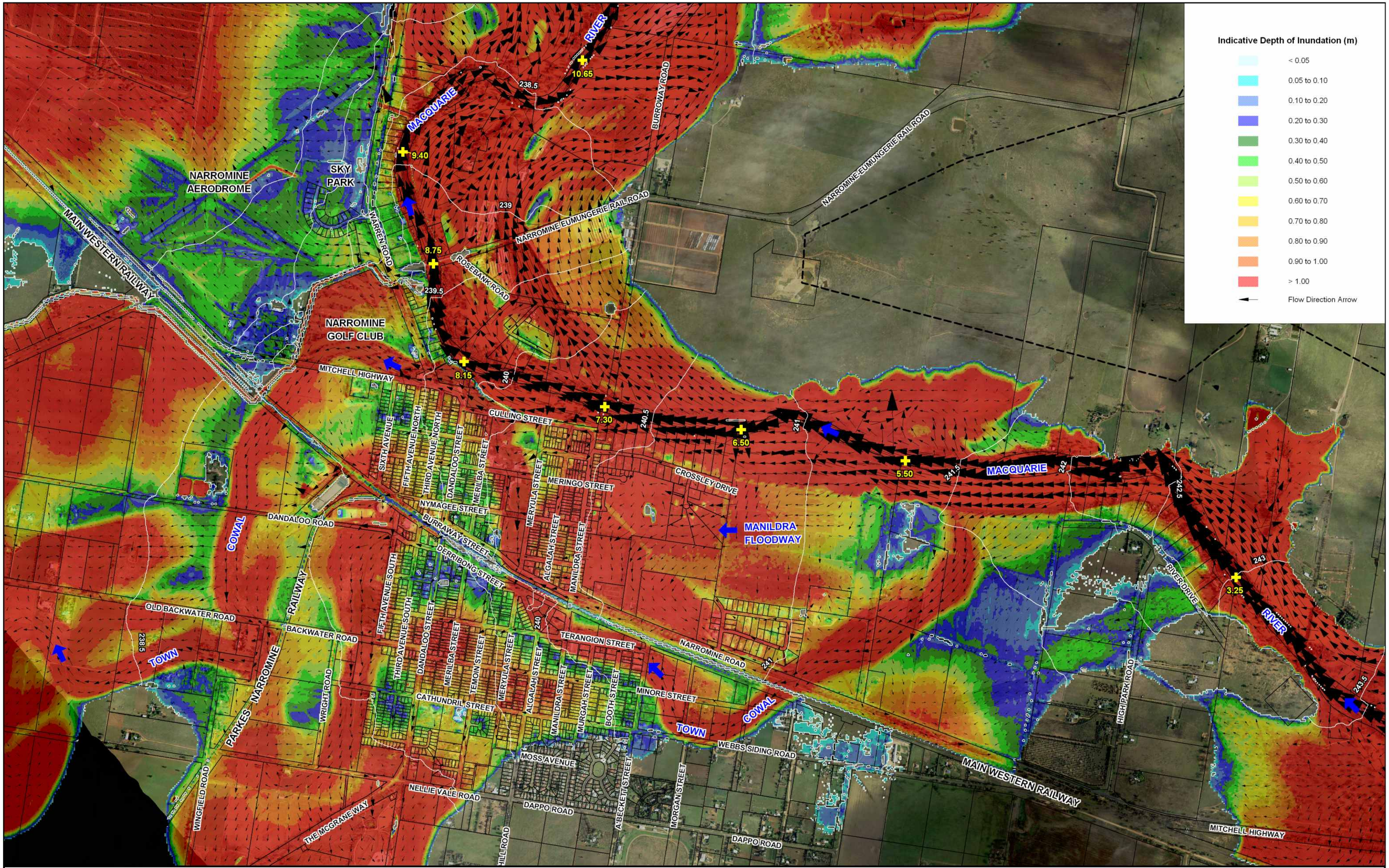
7.30 MIKE 11 River Chainage

237.5 Water Surface Elevation (m AHD)

NARROMINE RIVER BANK LEVEE FEASIBILITY STUDY

Figure 3.2
(Sheet 1 of 2)

TUFLOW MODEL RESULTS
0.5% AEP (BEST ESTIMATE HYDRAULIC ROUGHNESS VALUES)



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Scale: 1:20,000

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LEGEND

Two-Dimensional Model Boundary

7.30 MIKE 11 River Chainage

237.5 Water Surface Elevation (m AHD)

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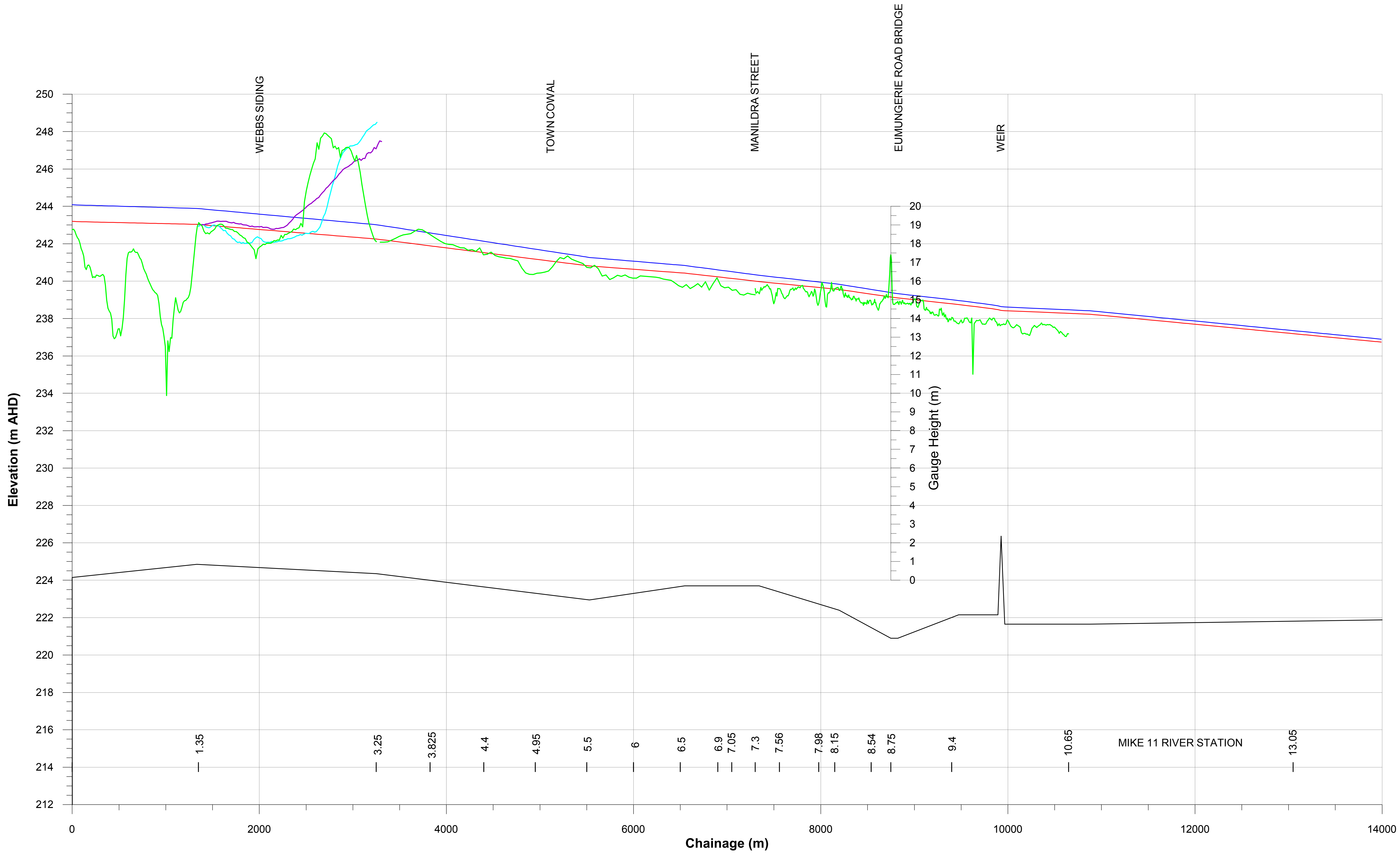
NARROMINE RIVER BANK LEVEE FEASIBILITY STUDY

Figure 3.2
(Sheet 2 of 2)

TUFLOW MODEL RESULTS
0.5% AEP (BEST ESTIMATE HYDRAULIC ROUGHNESS VALUES)



LEGEND

- 1% AEP Design Flood (TUFLOW Model)
- 0.5% AEP Design Flood (TUFLOW Model)
- Channel Invert
- LiDAR Survey Data Levels along Southern Bank of Macquarie River
- LiDAR Survey Data Levels along Mitchell Highway
- LiDAR Survey Data Levels along Main Western Railway

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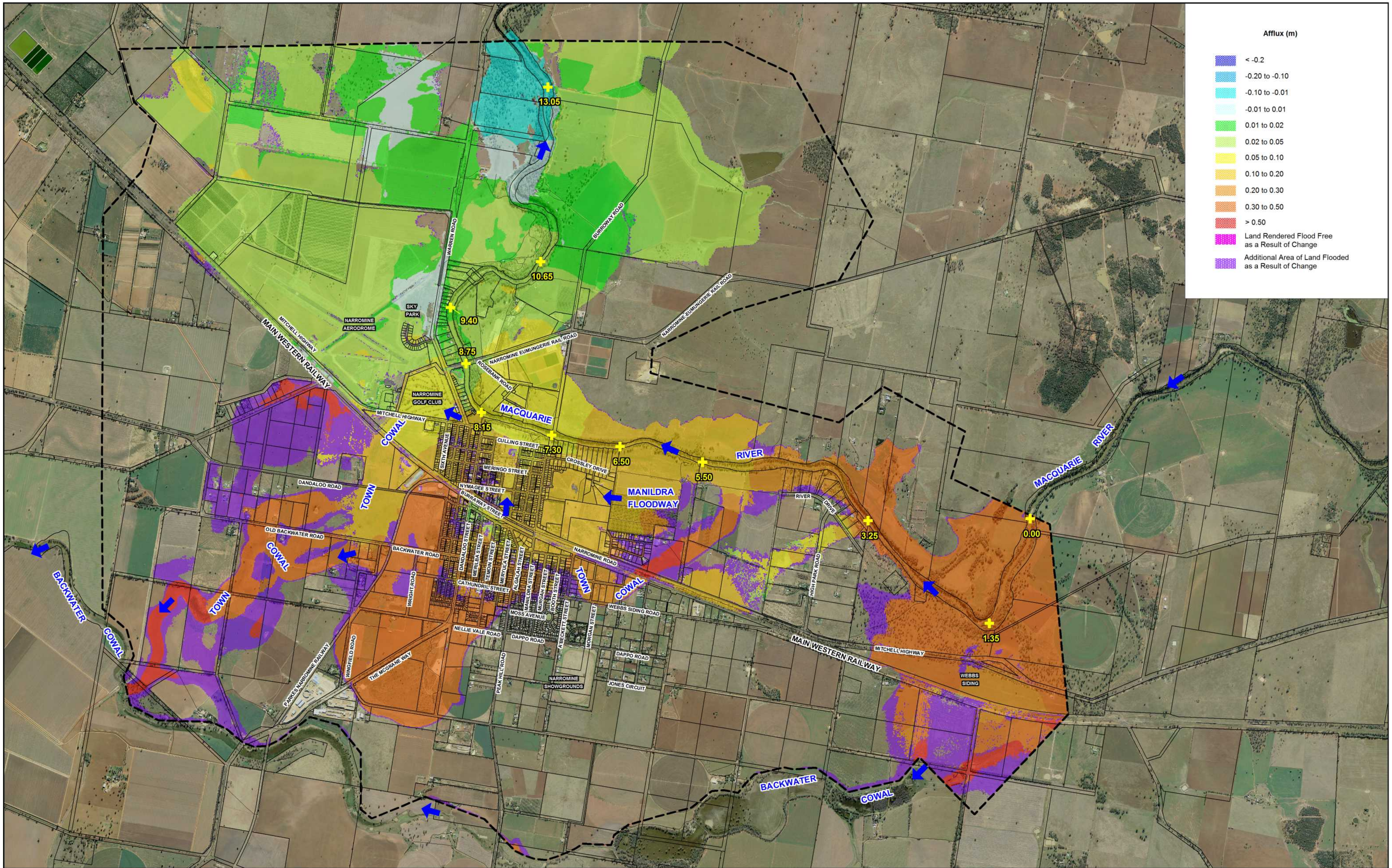
NARROMINE RIVER BANK LEVEE FEASIBILITY STUDY

Figure 3.3

DESIGN WATER SURFACE PROFILES
MACQUARIE RIVER



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Scale: 1:40,000

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LEGEND

Two-Dimensional Model Boundary

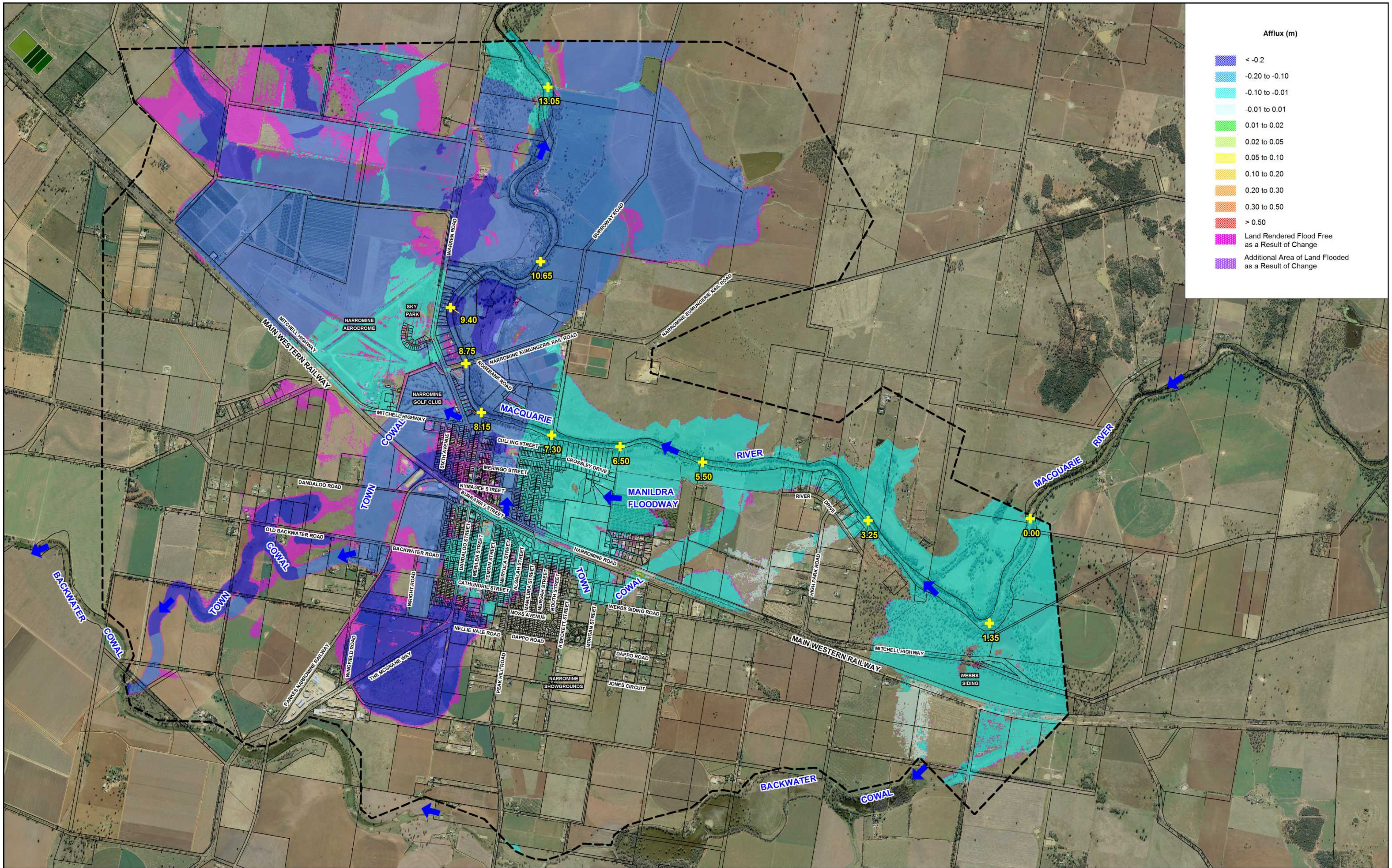
7.30 MIKE 11 River Chainage

NARROMINE RIVER BANK LEVEE FEASIBILITY STUDY

Figure 3.4

SENSITIVITY OF FLOOD BEHAVIOUR TO 20% INCREASE IN HYDRAULIC ROUGHNESS VALUES ALONG THE TOTAL LENGTH OF MODELLED REACH OF RIVER

1% AEP



N
400 0 400 800 1200 m
Scale: 1:40,000

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LEGEND

Two-Dimensional Model Boundary

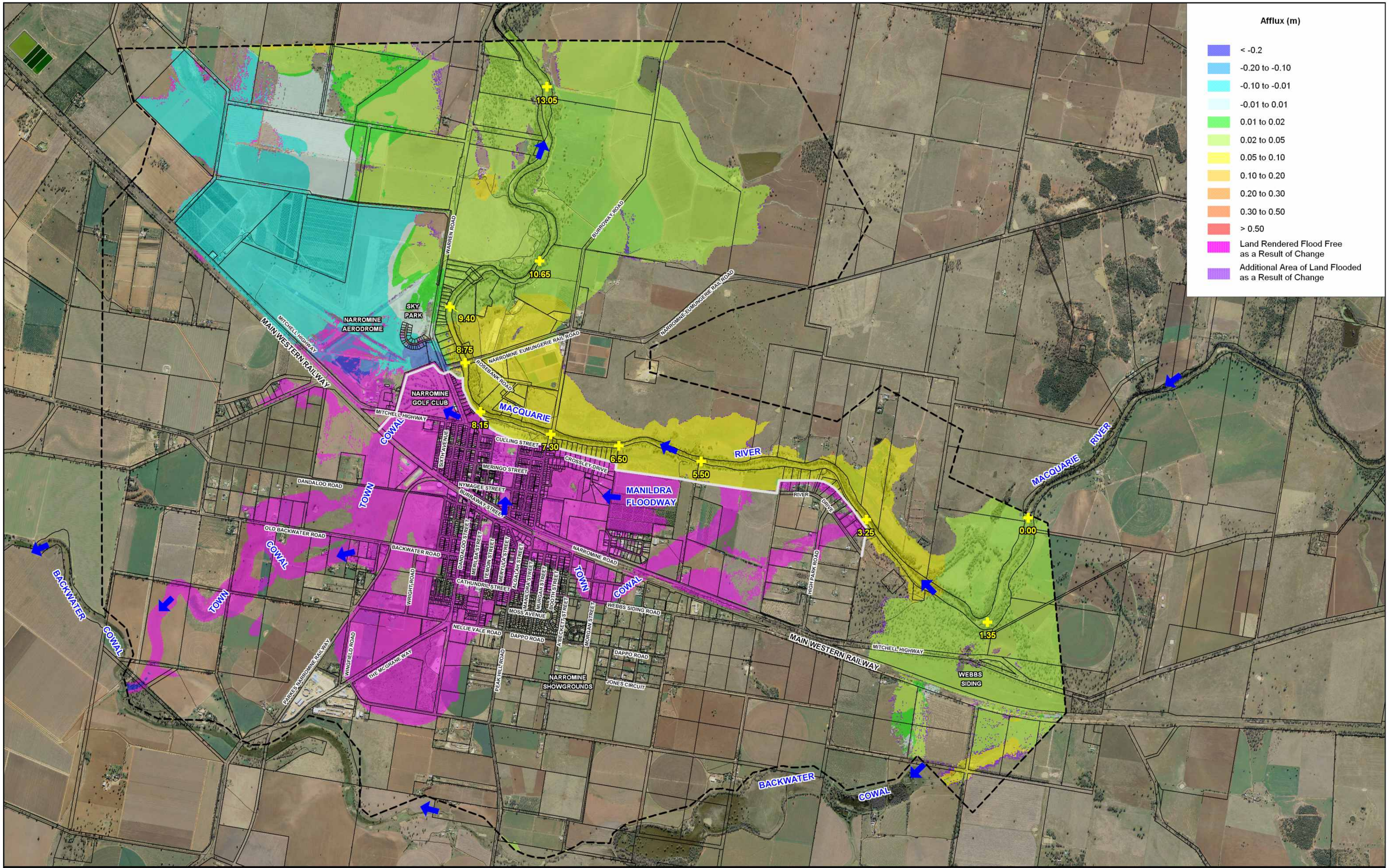
7.30 MIKE 11 River Chainage

NARROMINE RIVER BANK LEVEE FEASIBILITY STUDY

Figure 3.5

SENSITIVITY OF FLOOD BEHAVIOUR TO 20% INCREASE IN HYDRAULIC ROUGHNESS VALUES ALONG THE MODELLED REACH OF RIVER DOWNSTREAM OF THE NARROMINE-EUMUNGERIE ROAD BRIDGE

1% AEP



400 0 400 800 1200 m

Scale: 1:40,000

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LEGEND

Two-Dimensional Model Boundary

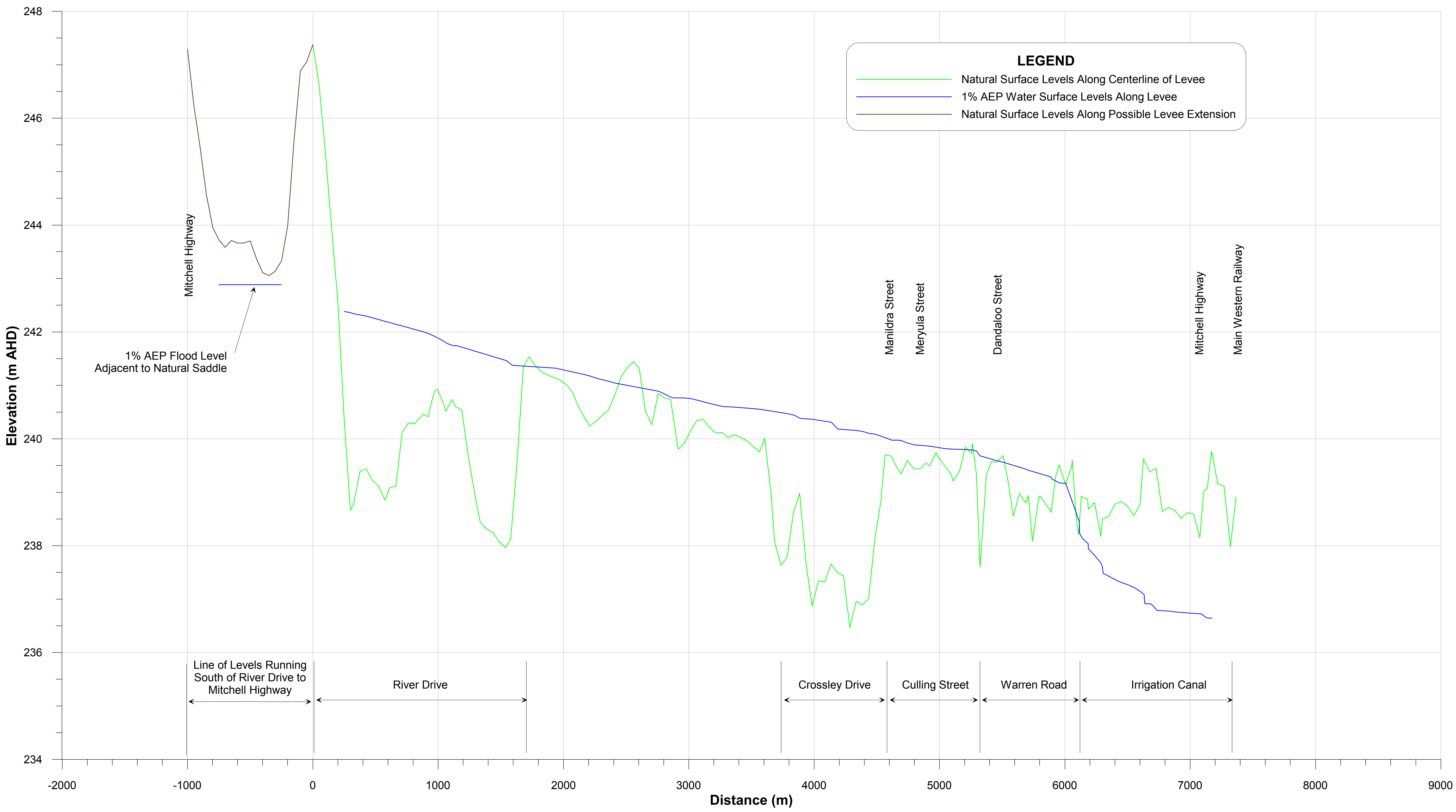
MIKE 11 River Chainage

Levee Route

NARROMINE RIVER BANK LEVEE FEASIBILITY STUDY

Figure 4.1

IMPACT OF LEVEE OPTION 1 ON FLOOD BEHAVIOUR
1% AEP



NARROMINE RIVER BANK LEVEE
FEASIBILITY STUDY

Figure 4.2

LONGITUDINAL SECTION ALONG LEVEE OPTION 1 ALIGNMENT

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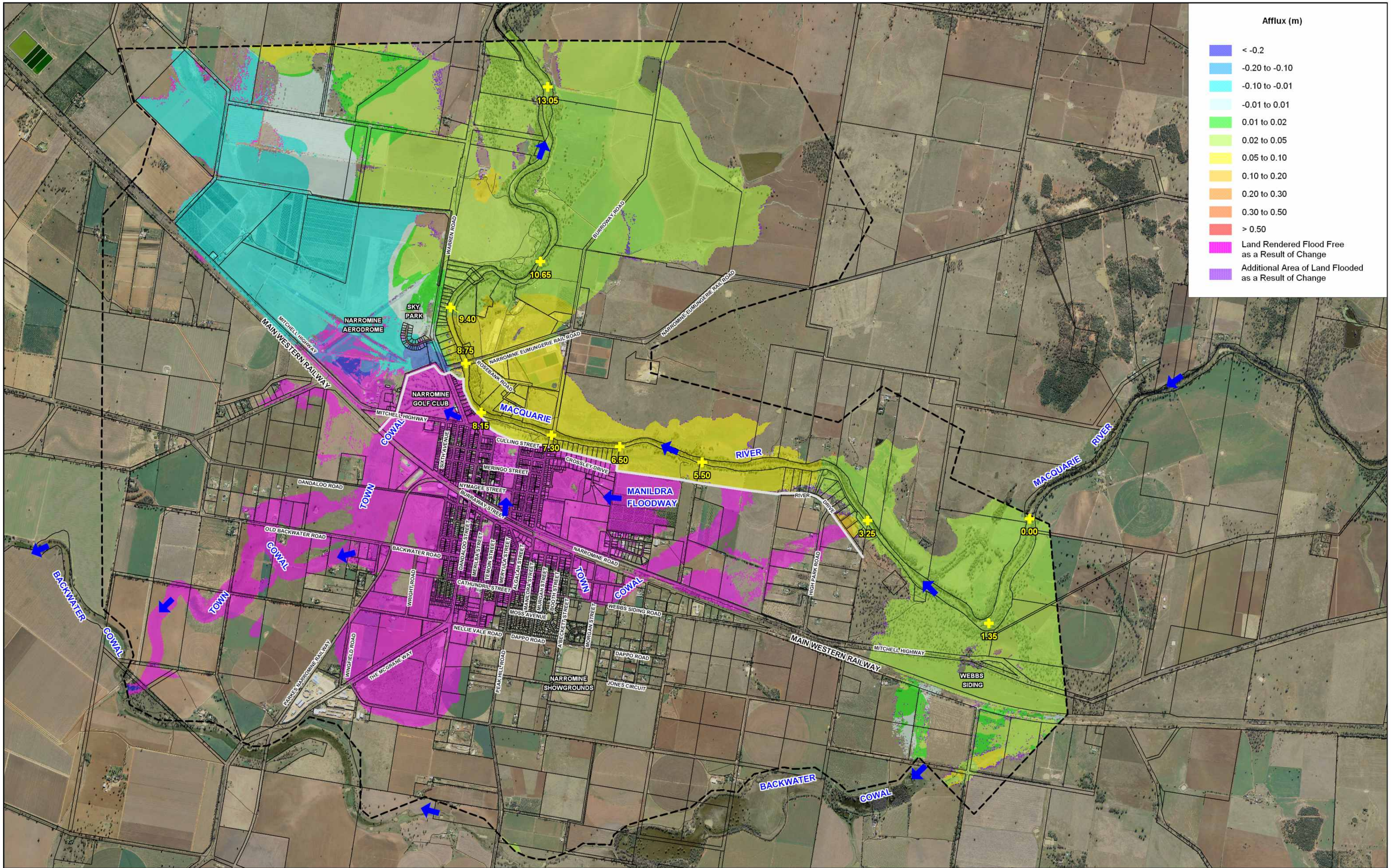

400 0 400 800 1200 m

Scale: 1:40,000

LEGEND

Two-Dimensional Model Boundary

MIKE 11 River Chainage

Levee Route

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NARROMINE RIVER BANK LEVEE FEASIBILITY STUDY

Figure 4.3

IMPACT OF LEVEE OPTION 2 ON FLOOD BEHAVIOUR
1% AEP

NARROMINE RIVER BANK LEVEE
FEASIBILITY STUDY

Figure 4.4

LONGITUDINAL SECTION ALONG LEVEE OPTION 2 ALIGNMENT

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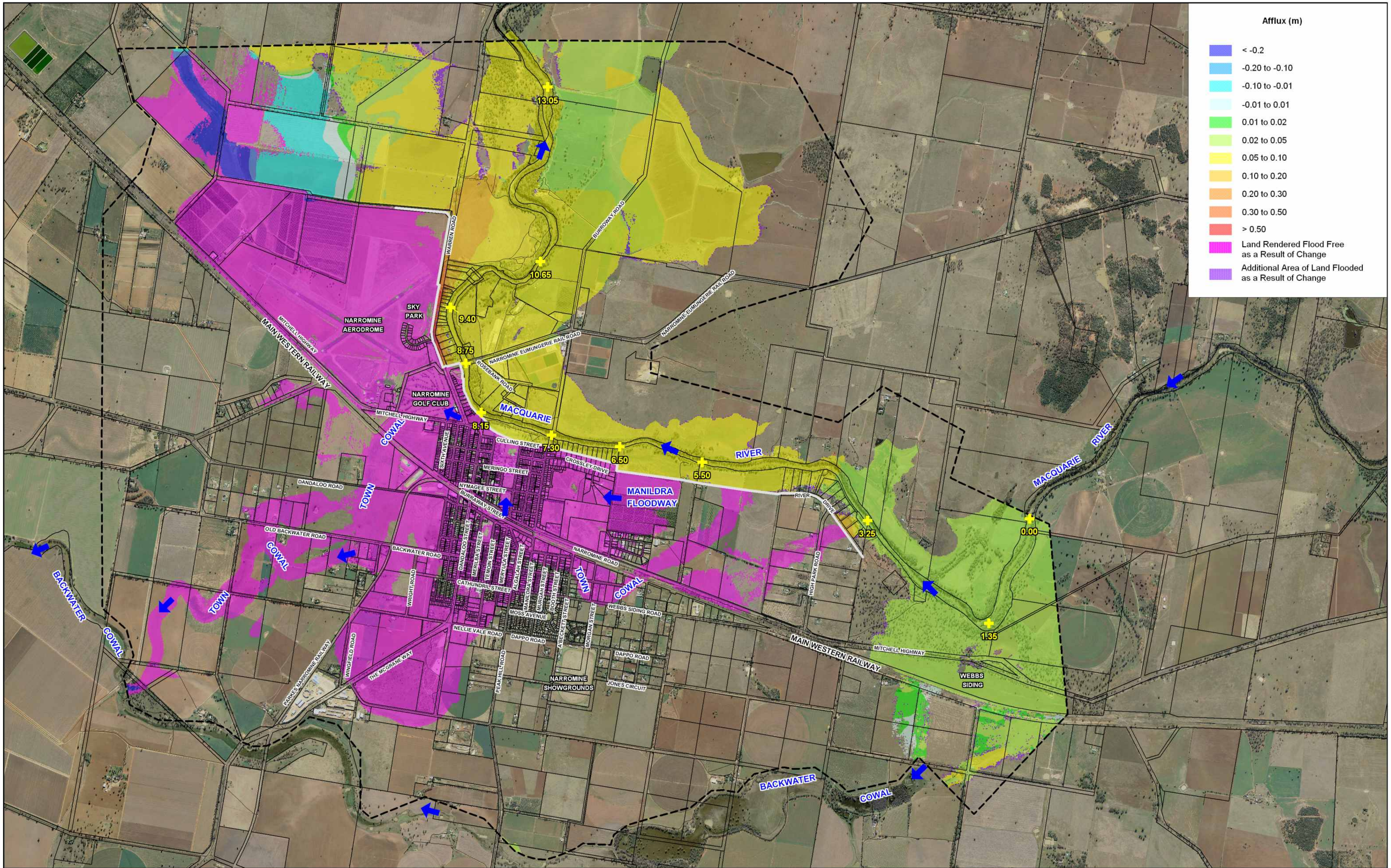

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400 0 400 800 1200 m

Scale: 1:40,000

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LEGEND

Two-Dimensional Model Boundary

7.30 MIKE 11 River Chainage

Levee Route

NARROMINE RIVER BANK LEVEE FEASIBILITY STUDY

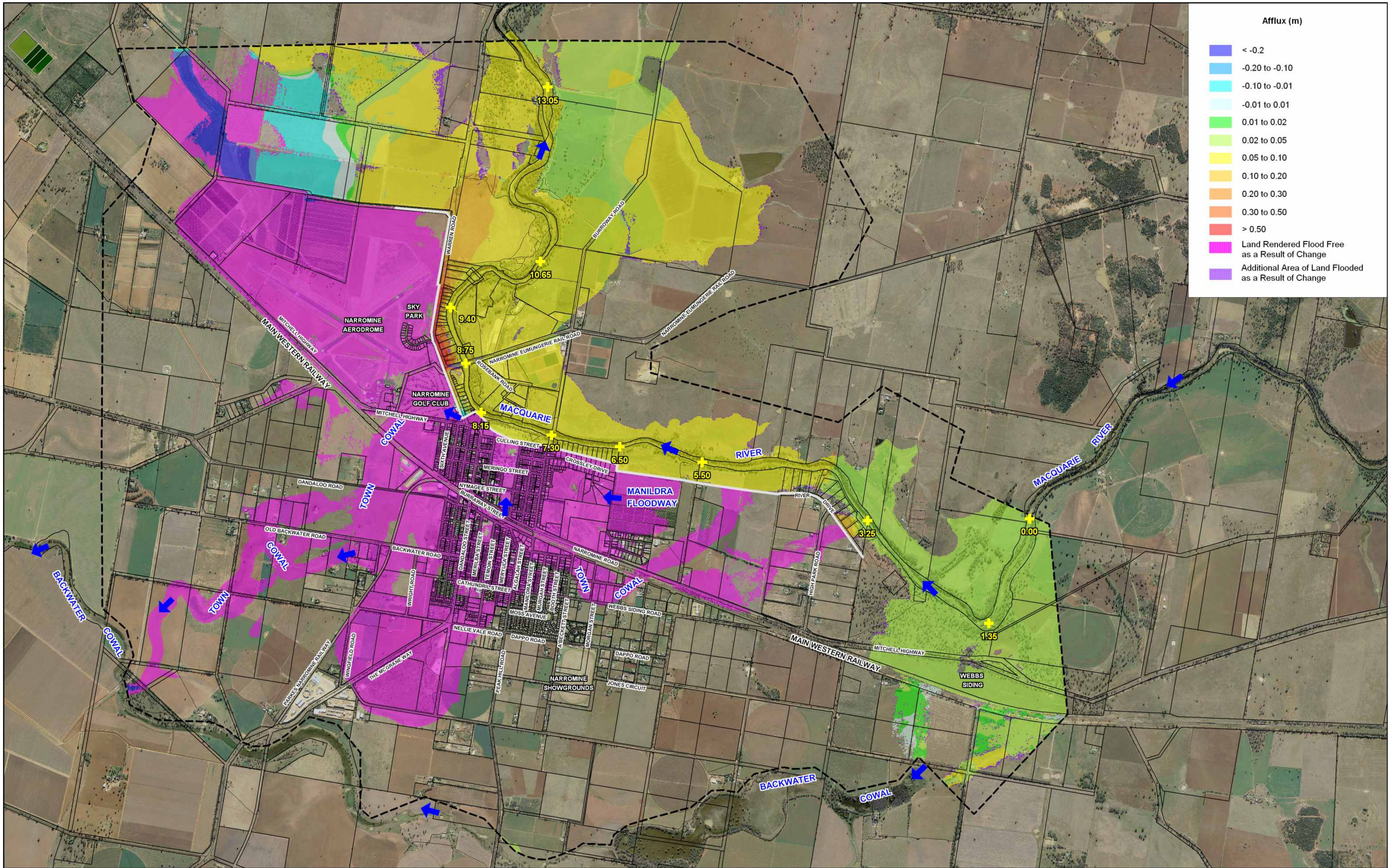
Figure 4.5

IMPACT OF LEVEE OPTION 2A ON FLOOD BEHAVIOUR
1% AEP

NARROMINE RIVER BANK LEVEE
FEASIBILITY STUDY

Figure 4.6

LONGITUDINAL SECTION ALONG LEVEE OPTION 2A ALIGNMENT



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Scale: 1:40,000

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LEGEND

Two-Dimensional Model Boundary

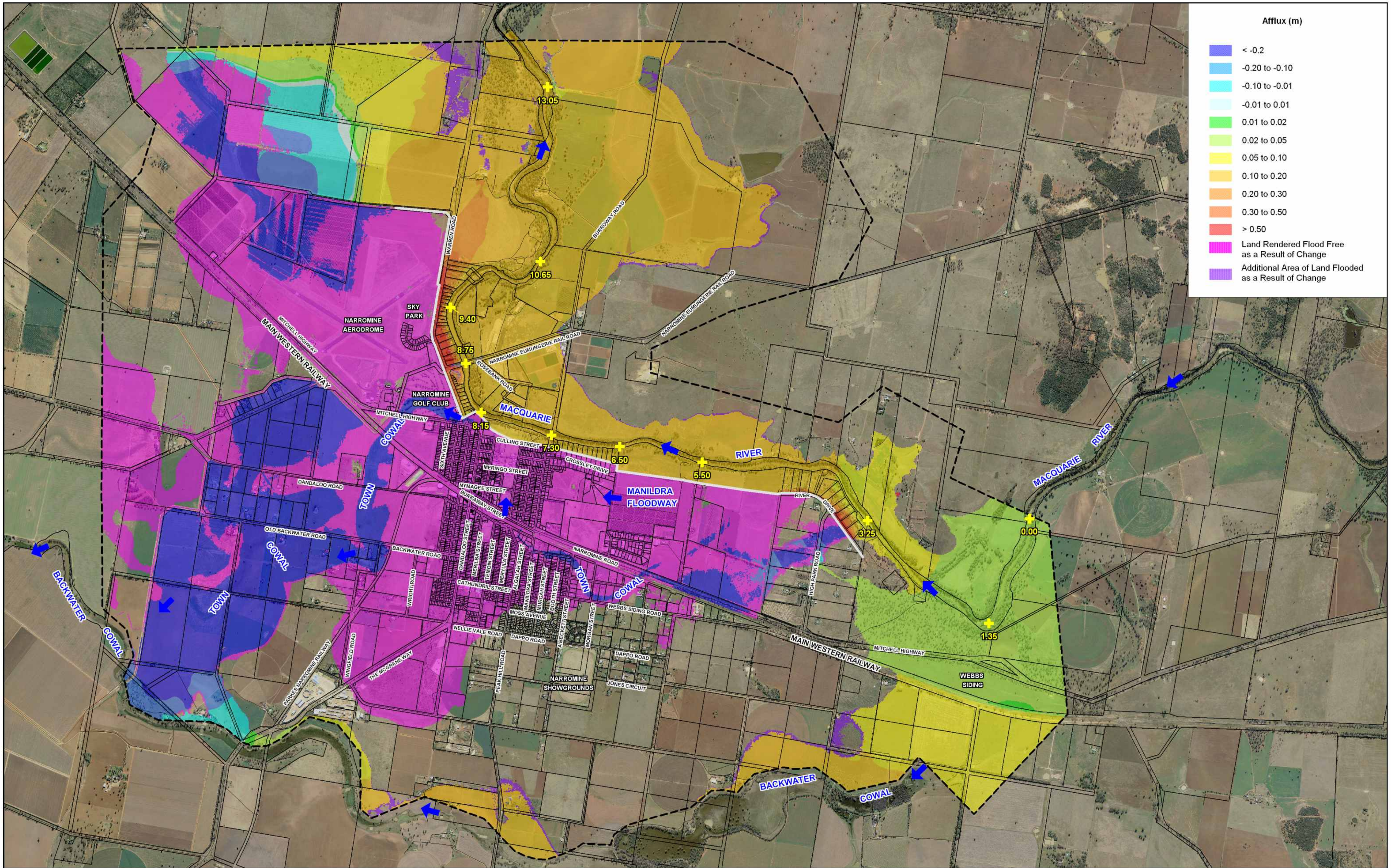
7.30 MIKE 11 River Chainage

Levee Route

NARROMINE RIVER BANK LEVEE FEASIBILITY STUDY

Figure 4.7

IMPACT OF LEVEE OPTION 2A(i) ON FLOOD BEHAVIOUR
1% AEP



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400 0 400 800 1200 m

Scale: 1:40,000

LEGEND

Two-Dimensional Model Boundary

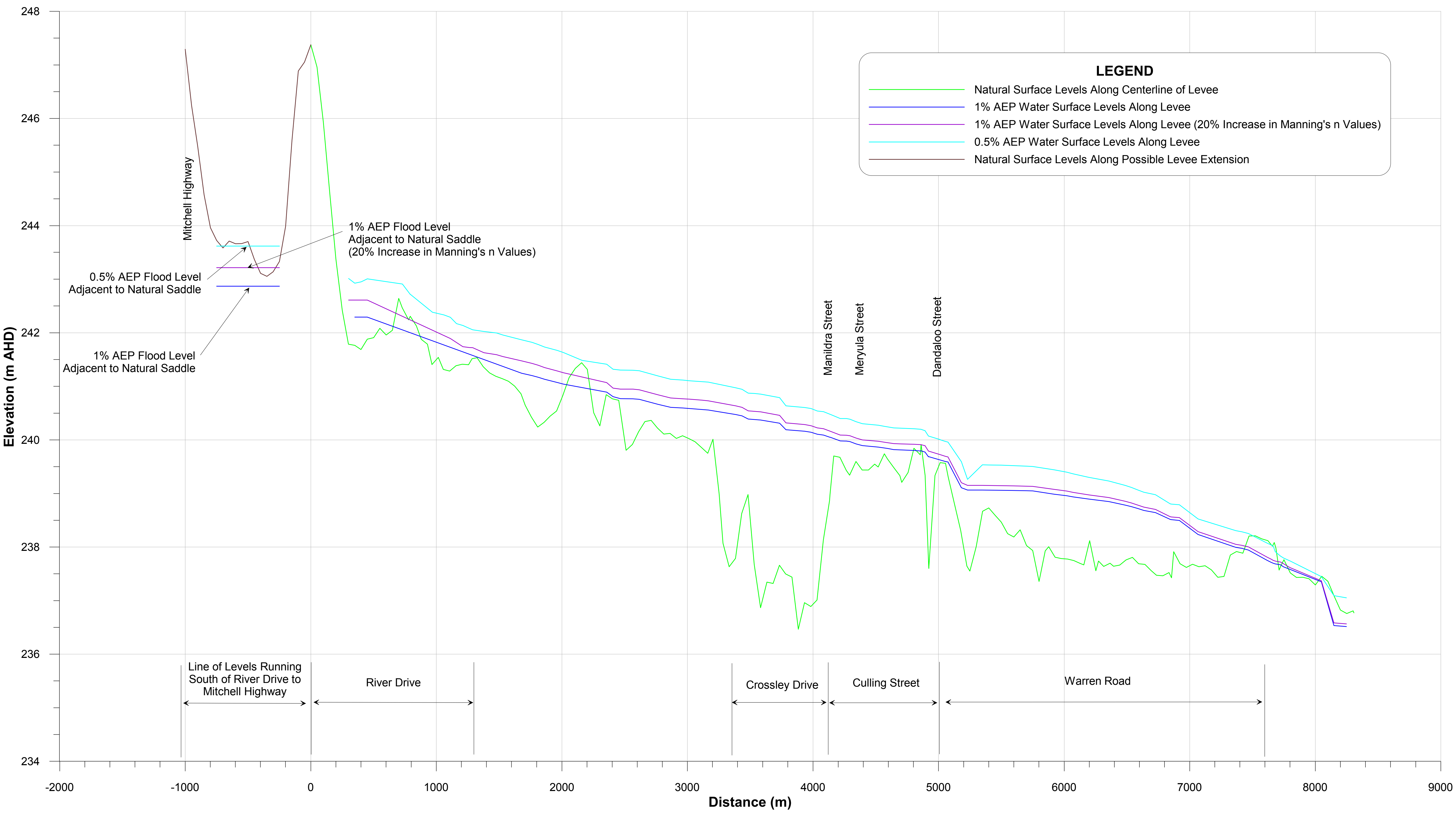
7.30 MIKE 11 River Chainage

Levee Route

NARROMINE RIVER BANK LEVEE FEASIBILITY STUDY

Figure 4.8

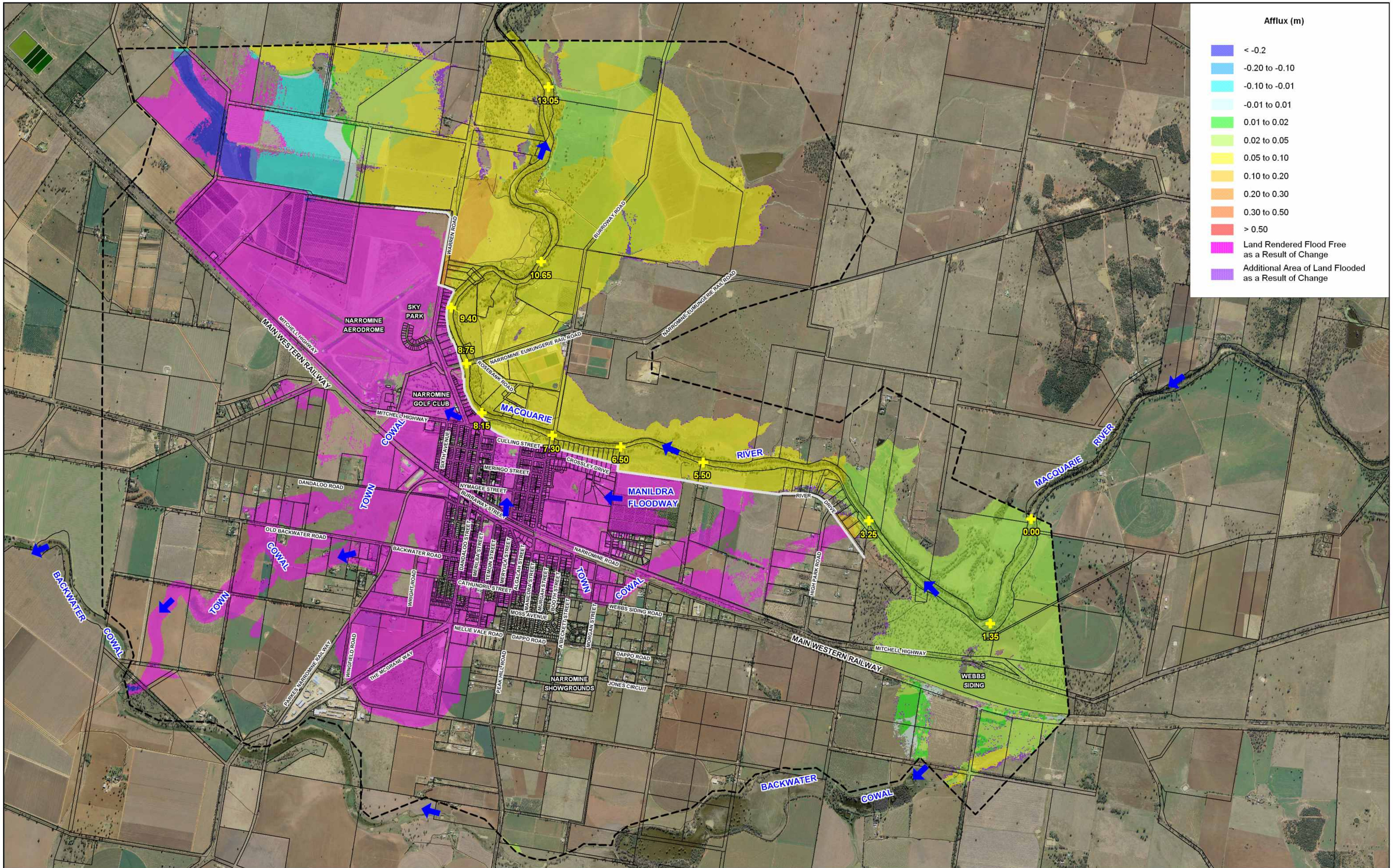
IMPACT OF LEVEE OPTION 2A(i) ON FLOOD BEHAVIOUR
0.5% AEP



NARROMINE RIVER BANK LEVEE FEASIBILITY STUDY

Figure 4.9

LONGITUDINAL SECTION ALONG LEVEE OPTION 2A(i) ALIGNMENT



N

400 0 400 800 1200 m

Scale: 1:40,000

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LEGEND

Two-Dimensional Model Boundary

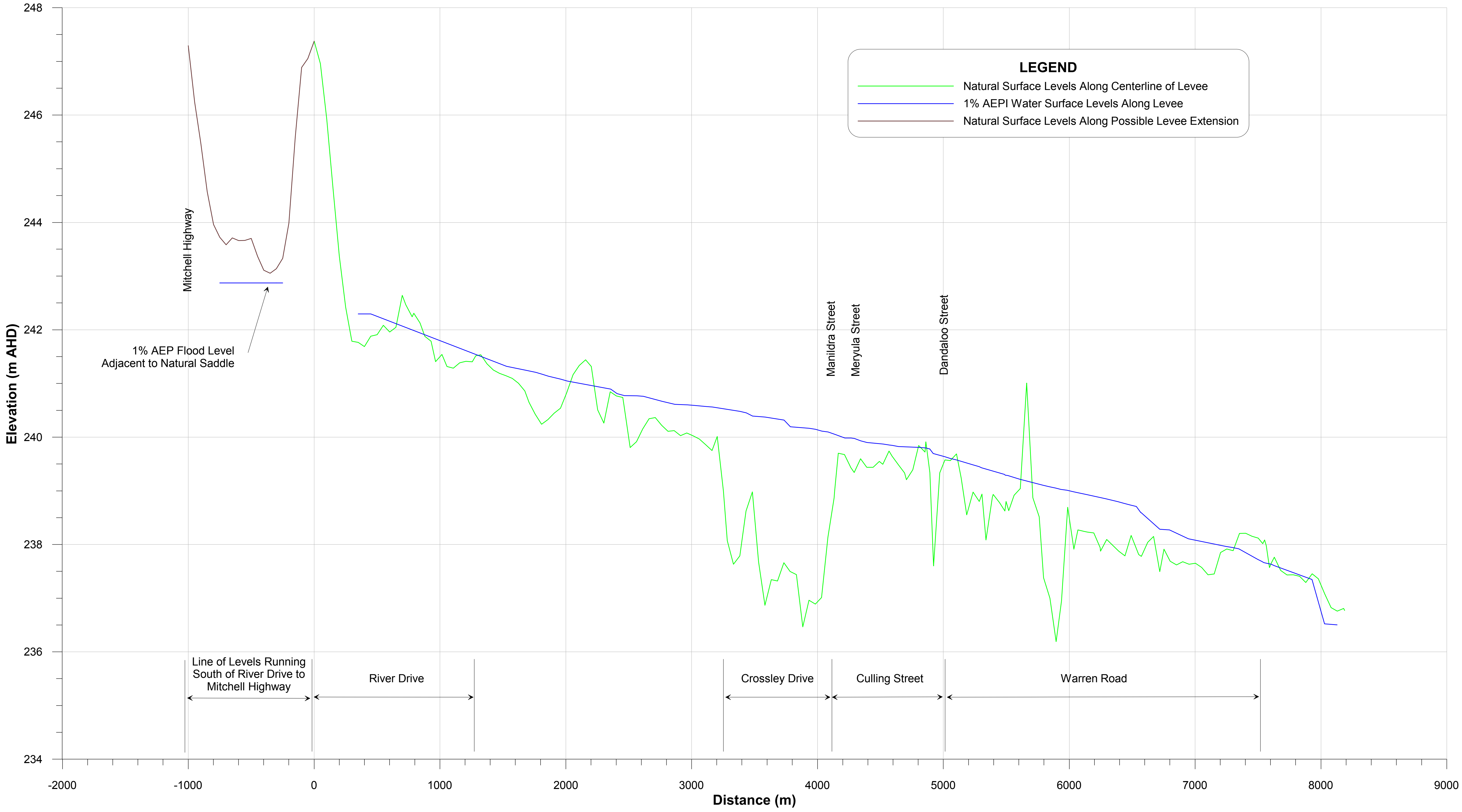
7.30 MIKE 11 River Chainage

Levee Route

NARROMINE RIVER BANK LEVEE FEASIBILITY STUDY

Figure 4.10

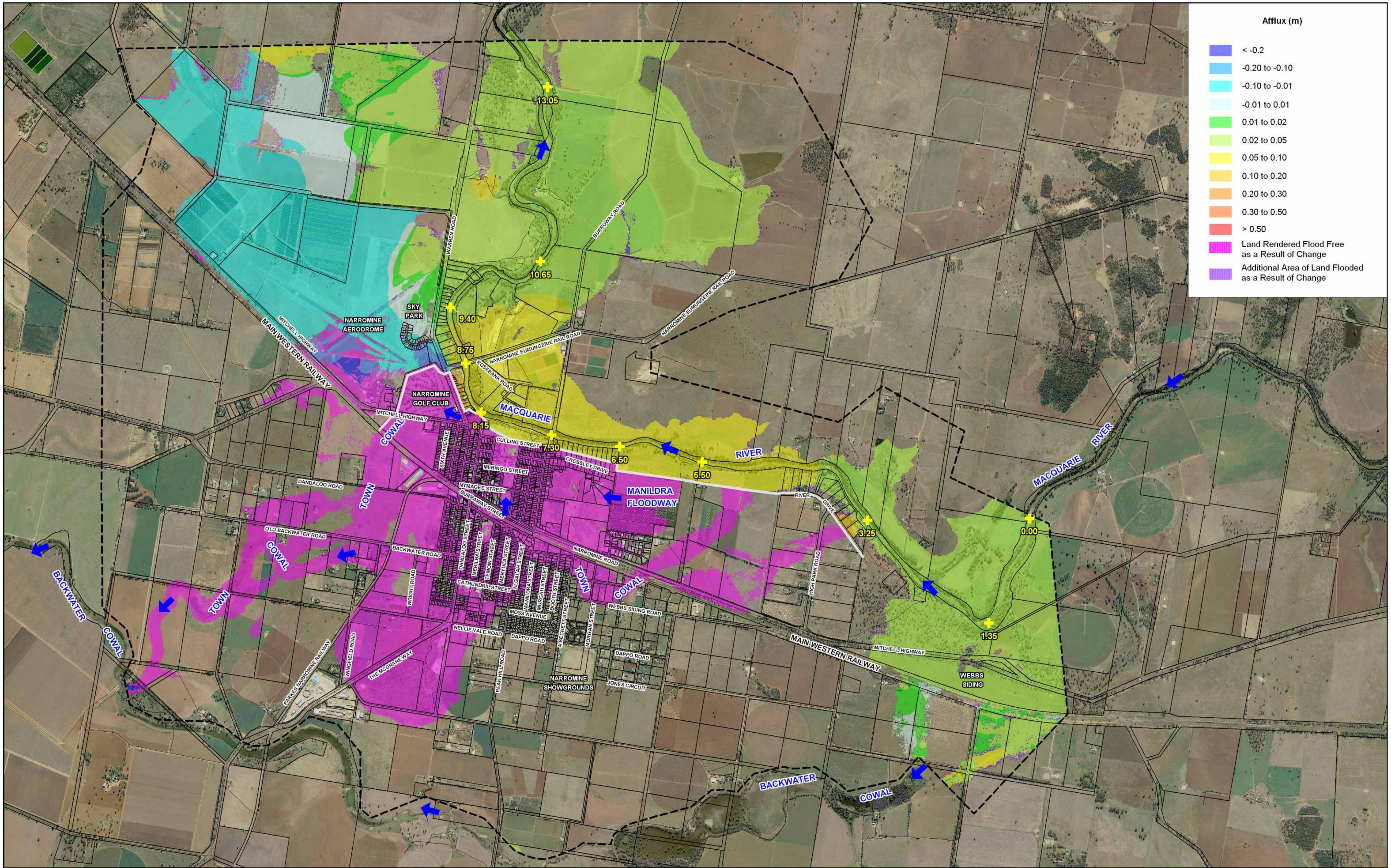
IMPACT OF LEVEE OPTION 2B ON FLOOD BEHAVIOUR 1% AEP



NARROMINE RIVER BANK LEVEE
FEASIBILITY STUDY

Figure 4.11

LONGITUDINAL SECTION ALONG LEVEE OPTION 2B ALIGNMENT



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400 0 400 800 1200 m

Scale: 1:40,000

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LEGEND

Two-Dimensional Model Boundary

7.30 MIKE 11 River Chainage

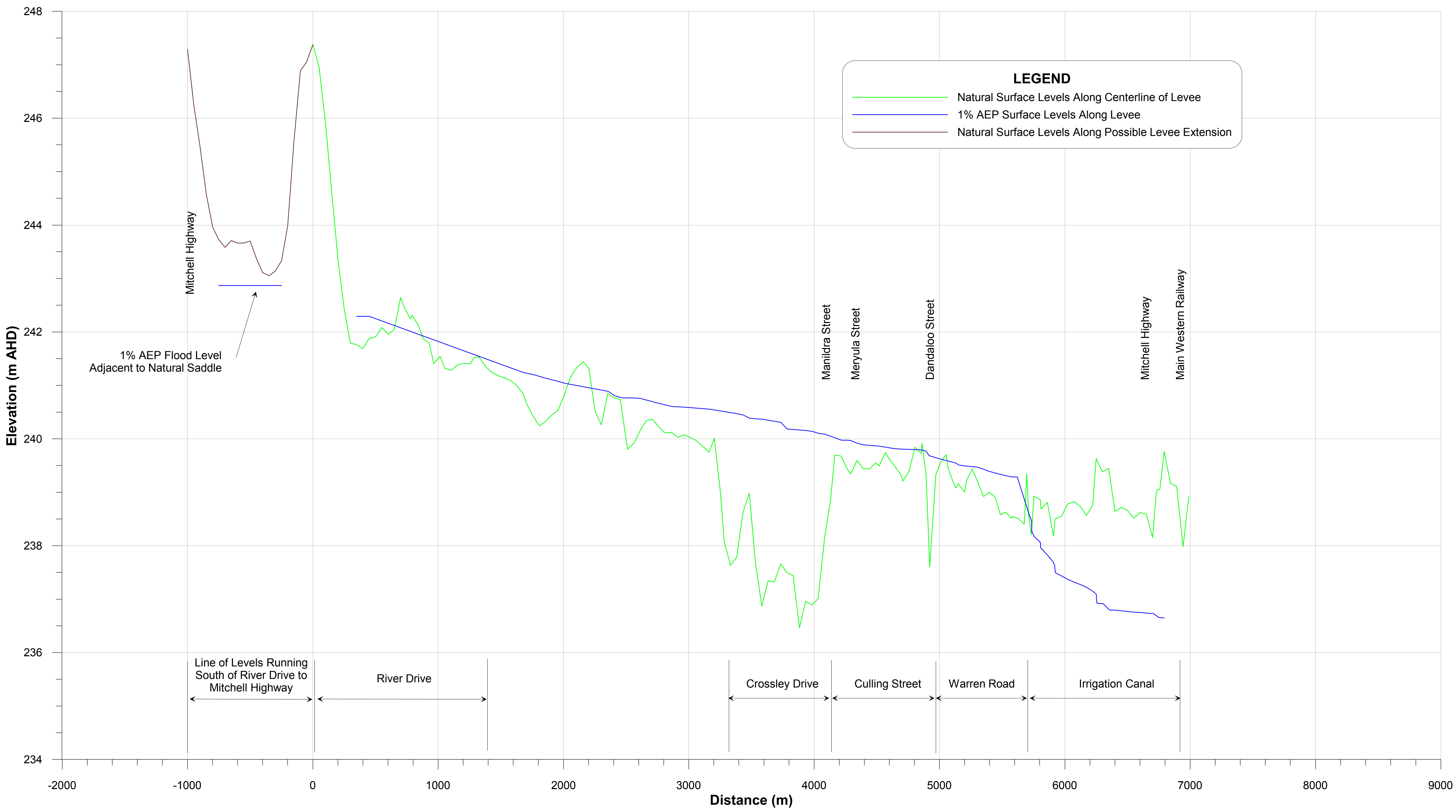
Levee Route

NARROMINE RIVER BANK LEVEE FEASIBILITY STUDY

Figure 4.12

IMPACT OF LEVEE OPTION 2C ON FLOOD BEHAVIOUR

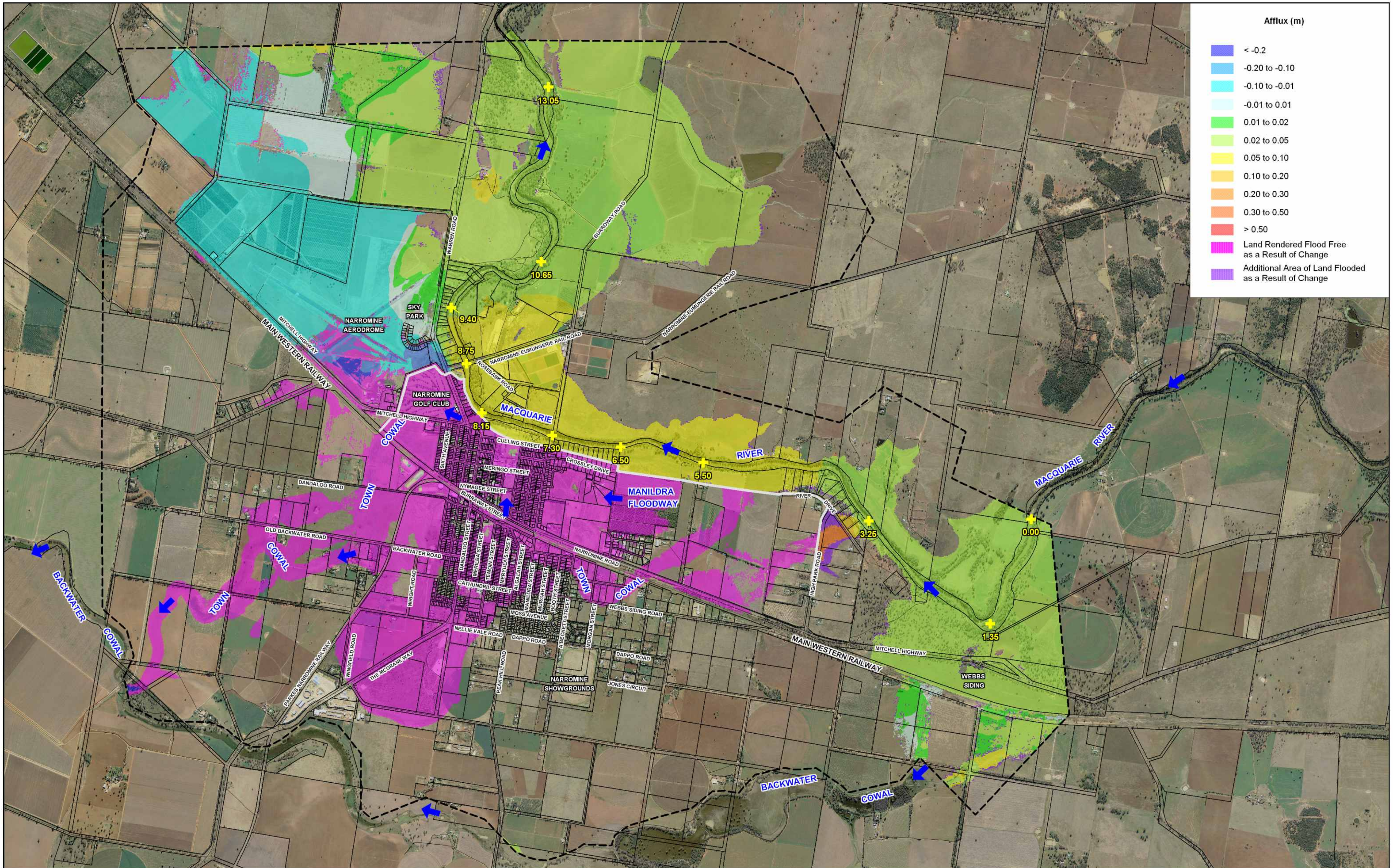
1% AEP



NARROMINE RIVER BANK LEVEE
FEASIBILITY STUDY

Figure 4.13

LONGITUDINAL SECTION ALONG LEVEE OPTION 2C ALIGNMENT



400	0	400	800	1200 m

Scale: 1:40,000

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LEGEND

Two-Dimensional Model Boundary

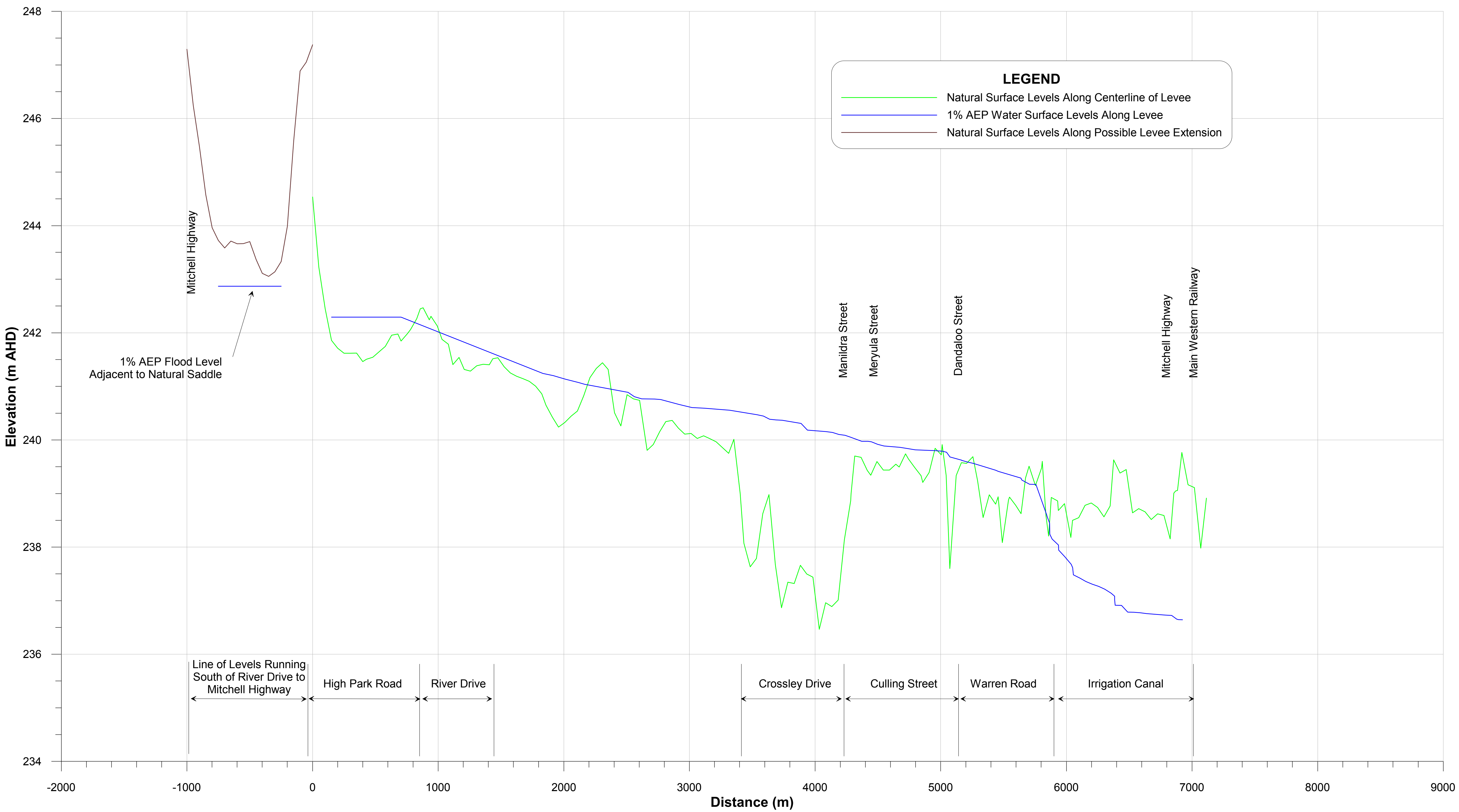
7.30 MIKE 11 River Chainage

Levee Route

NARROMINE RIVER BANK LEVEE
FEASIBILITY STUDY

Figure 4.14

IMPACT OF LEVEE OPTION 3 ON FLOOD BEHAVIOUR
1% AEP



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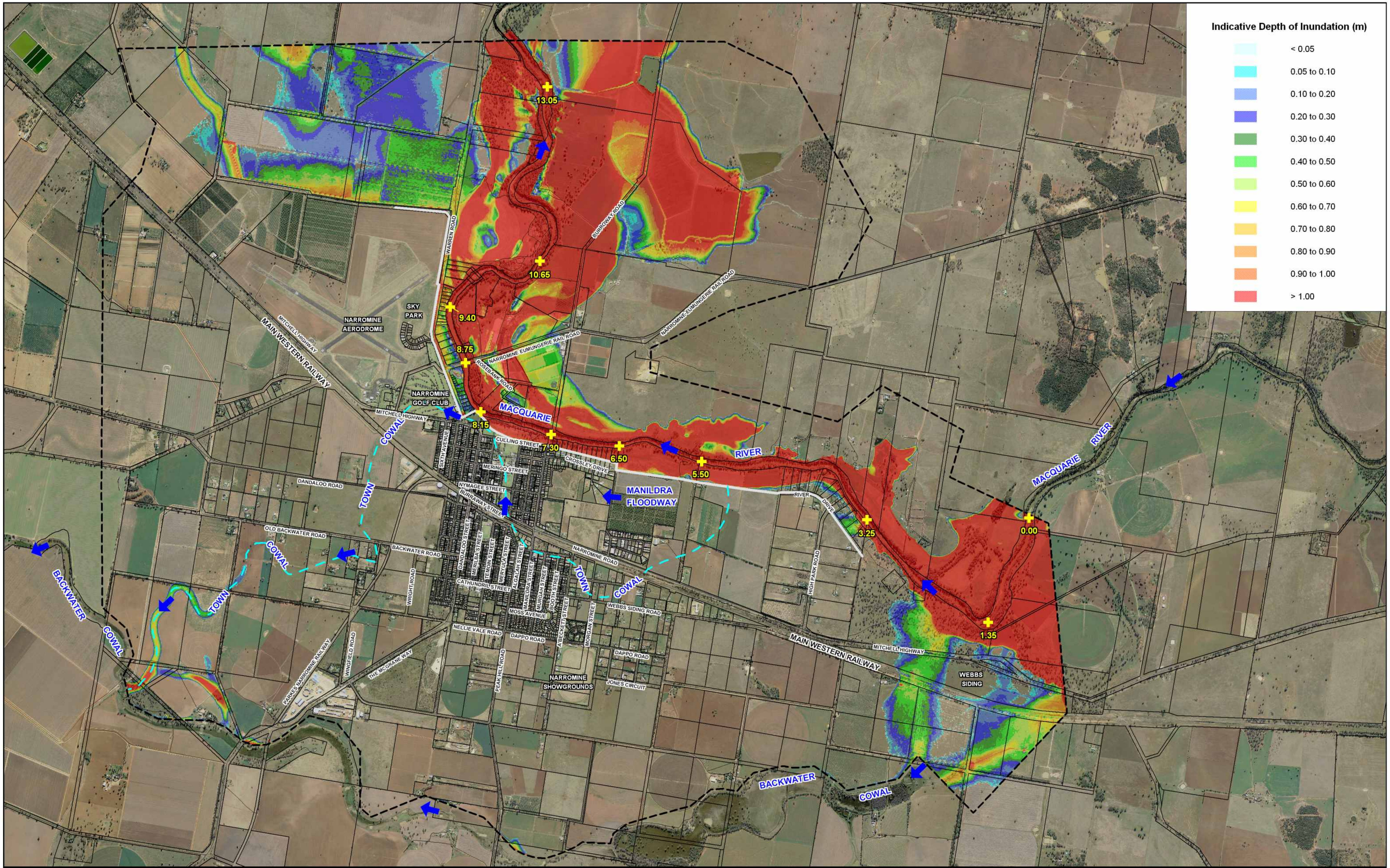
NARROMINE RIVER BANK LEVEE FEASIBILITY STUDY

Figure 4.15

LONGITUDINAL SECTION ALONG LEVEE OPTION ALIGNMENT 3



N

400 0 400 800 1200 m

Scale: 1:40,000

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LEGEND

Two-Dimensional Model Boundary

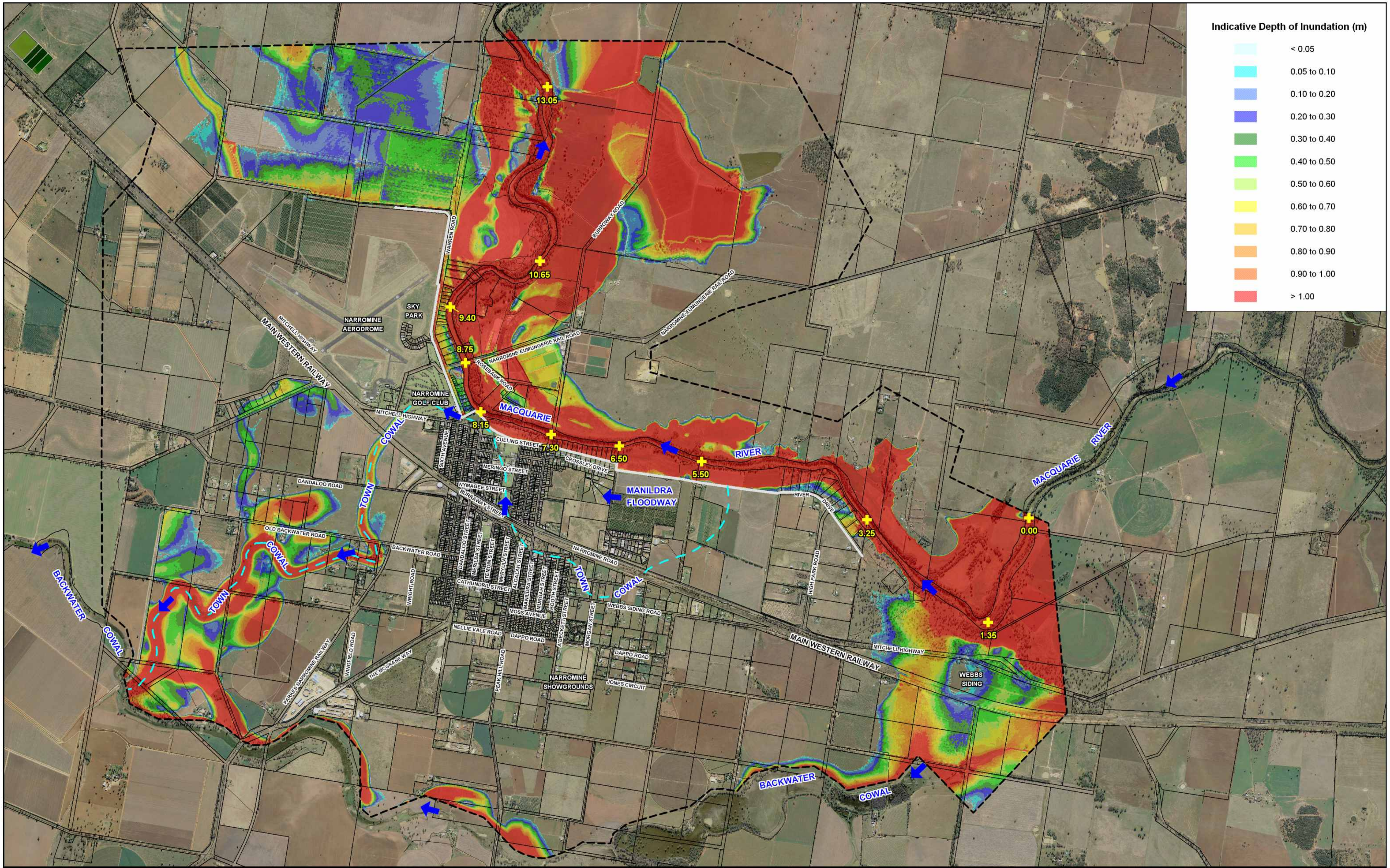
7.30 MIKE 11 River Chainage

Levee Route

NARROMINE RIVER BANK LEVEE FEASIBILITY STUDY

Figure 4.16

FLOOD BEHAVIOUR RESULTING FROM RAILWAY FAILURE
LEVEE OPTION 2A(i) - 1% AEP



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LEGEND

Two-Dimensional Model Boundary

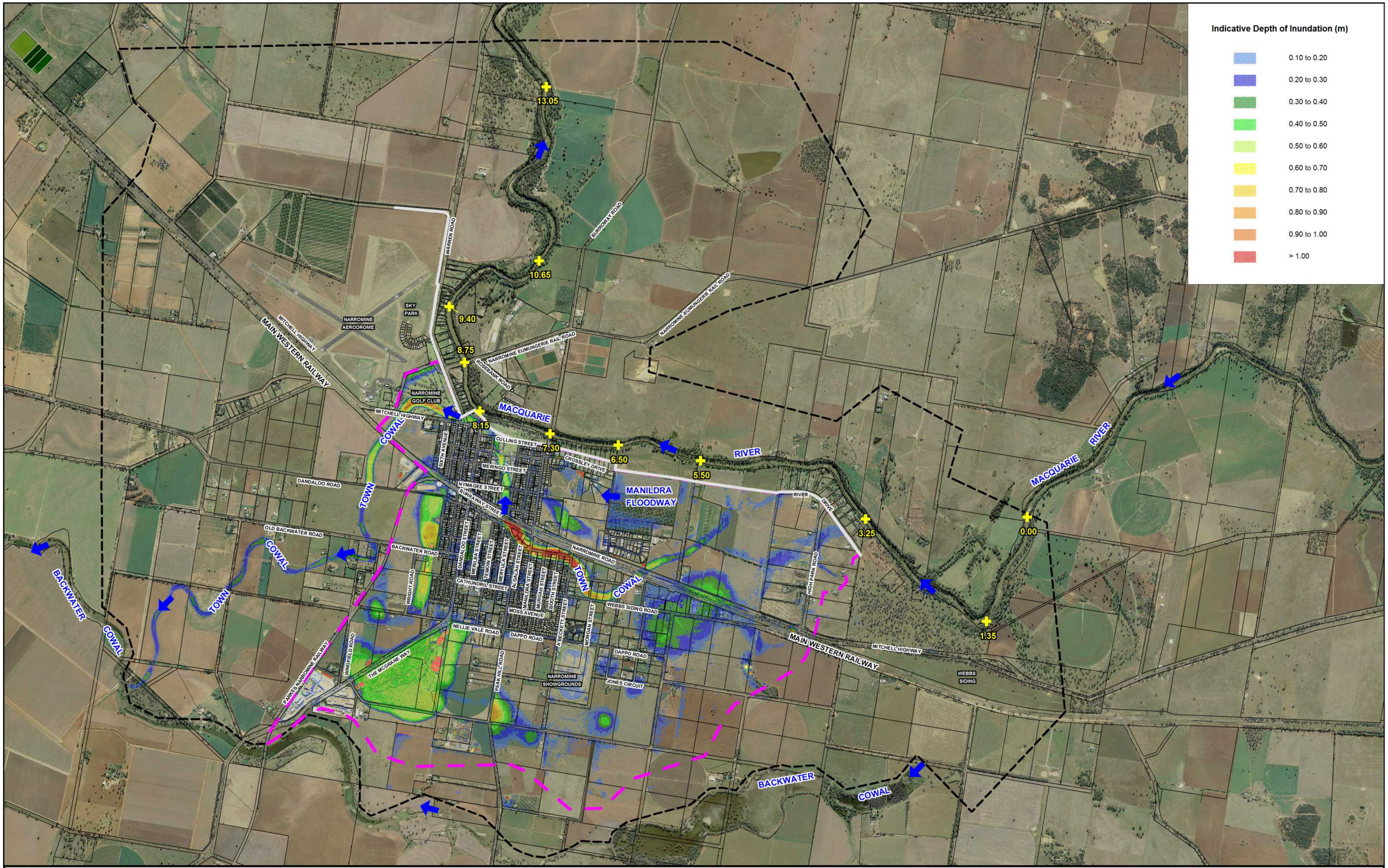
Levee Route

7.30 MIKE 11 River Chainage

NARROMINE RIVER BANK LEVEE FEASIBILITY STUDY

Figure 4.17

FLOOD BEHAVIOUR RESULTING FROM RAILWAY FAILURE AND COINCIDENT BACKWATER COWAL FLOOD
LEVEE OPTION 2A(i) - 1% AEP



N	400 0 400 800 1200 m		Scale: 1:40,000

LEGEND

- Two-Dimensional Model Boundary
- Direct Rainfall Boundary
- 7:30 MIKE 11 River Chainage
- Levee Route

NOTE:

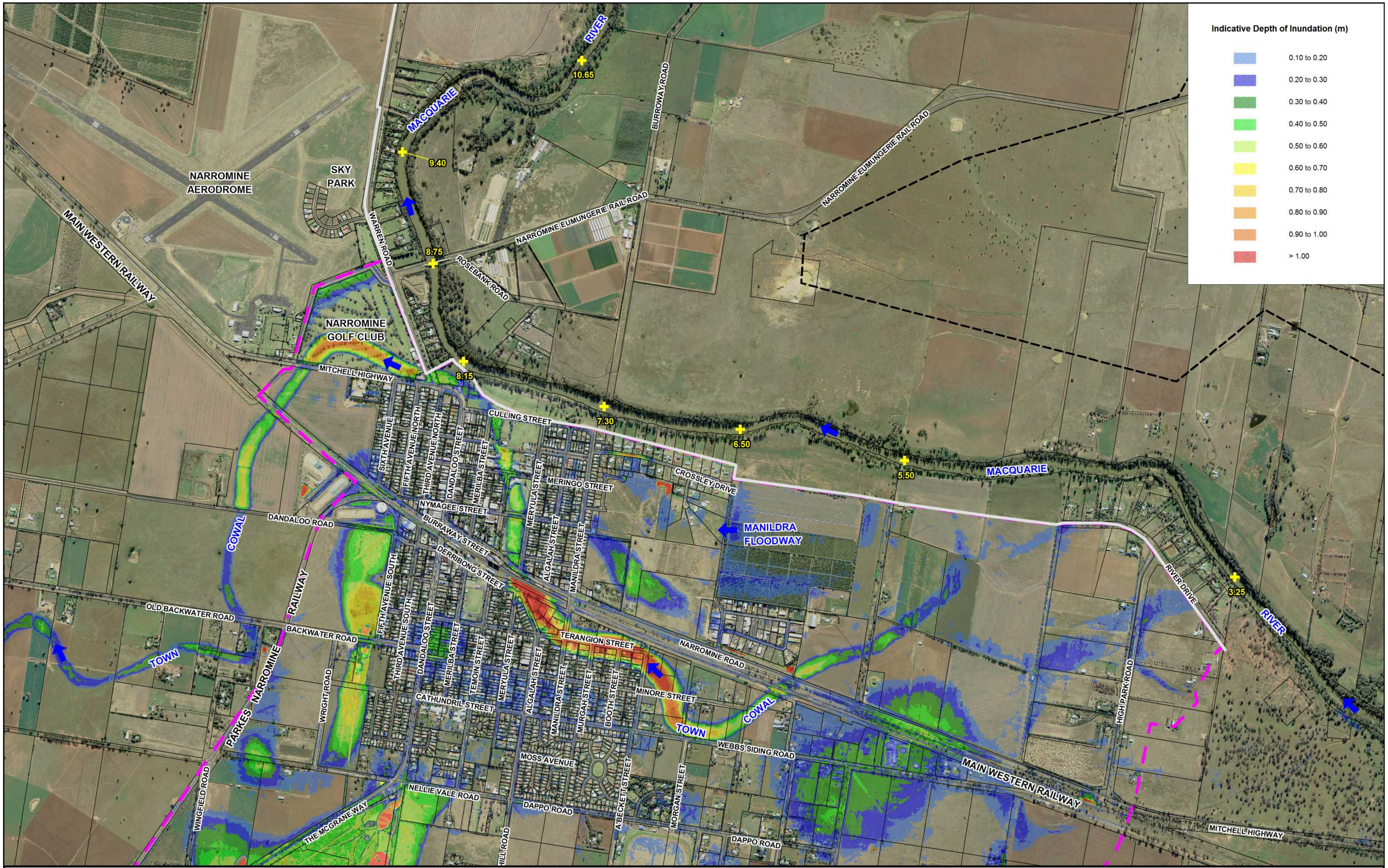
THE TUFLOW MODEL RESULTS SHOWN ON THIS FIGURE ARE NOT TO BE USED FOR PURPOSES OTHER THAN THE ASSESSMENT OF LEVEE OPTIONS. FOR EXAMPLE, THEY ARE NOT TO BE USED FOR SETTING MINIMUM FLOOR LEVEL REQUIREMENTS WITHIN NARROMINE OR DETERMINING THE EXACT EXTENT OF FLOOD AFFECTED LAND FOR PLANNING PURPOSES.

Lyall & Associates

NARROMINE RIVER BANK LEVEE FEASIBILITY STUDY

Figure 5.1
(Sheet 1 of 2)

LOCAL DRAINAGE PATTERNS IN NARROMINE - FLOOD GATES FULLY OPEN
POST LEVEE OPTION 2A(i) - 1% AEP



N

200 0 200 400 600 m

Scale: 1:20,000

LEGEND

- Two-Dimensional Model Boundary
- Direct Rainfall Boundary
- 7.30 MIKE 11 River Chainage
- Levee Route

NOTE:

THE TUFLOW MODEL RESULTS SHOWN ON THIS FIGURE ARE NOT TO BE USED FOR PURPOSES OTHER THAN THE ASSESSMENT OF LEVEE OPTIONS. FOR EXAMPLE, THEY ARE NOT TO BE USED FOR SETTING MINIMUM FLOOR LEVEL REQUIREMENTS WITHIN NARROMINE OR DETERMINING THE EXACT EXTENT OF FLOOD AFFECTED LAND FOR PLANNING PURPOSES.

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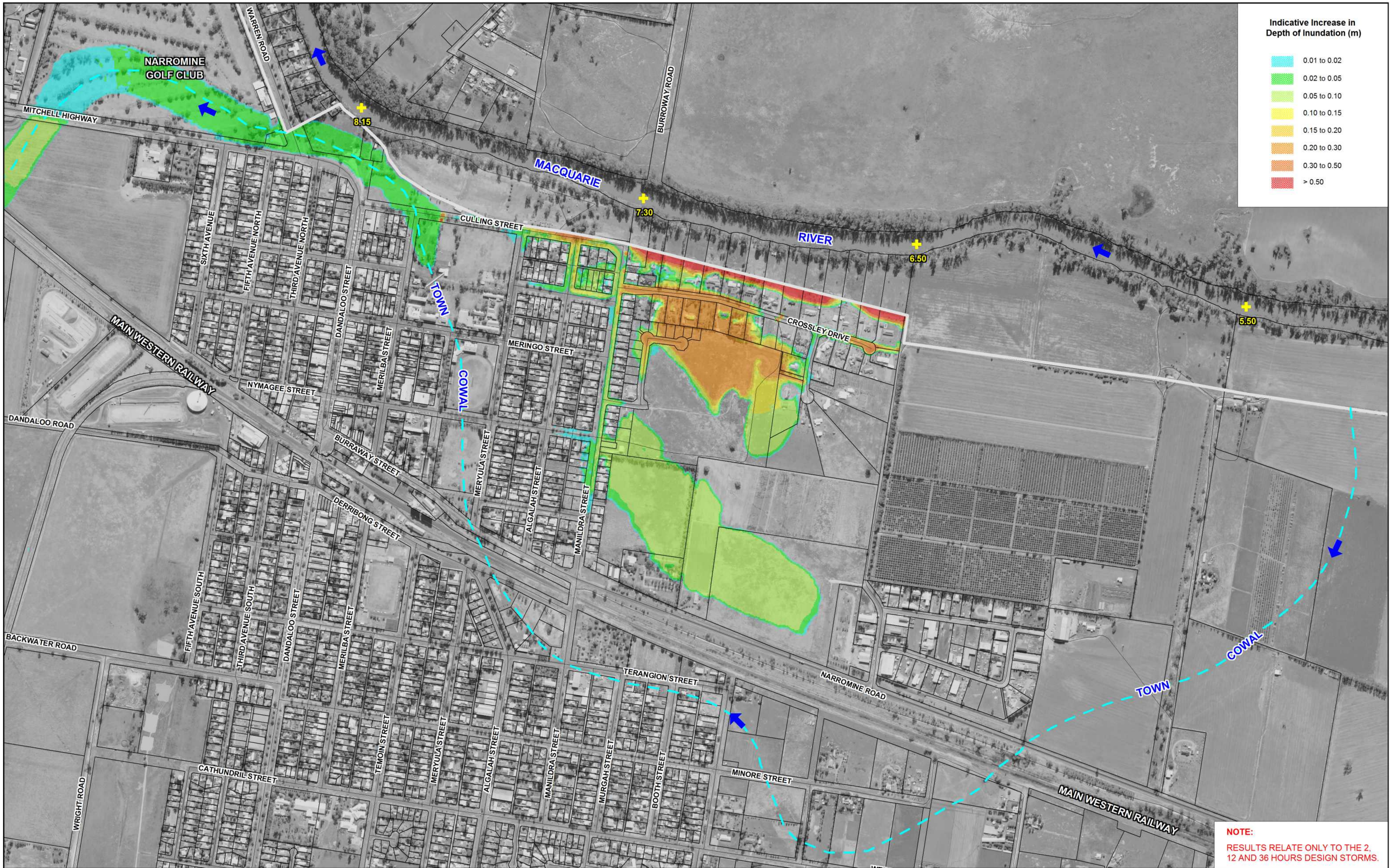
NARROMINE RIVER BANK LEVEE FEASIBILITY STUDY

Figure 5.1
(Sheet 2 of 2)

LOCAL DRAINAGE PATTERNS IN NARROMINE - FLOOD GATES FULLY OPEN
POST LEVEE OPTION 2A(i) - 1% AEP



N
100 0 100 200 300 m
Scale: 1:10,000

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NOTE:
THE TUFLOW MODEL RESULTS SHOWN ON THIS FIGURE ARE NOT TO BE USED FOR PURPOSES OTHER THAN THE ASSESSMENT OF LEVEE OPTIONS. FOR EXAMPLE, THEY ARE NOT TO BE USED FOR SETTING MINIMUM FLOOR LEVEL REQUIREMENTS WITHIN NARROMINE OR DETERMINING THE EXACT EXTENT OF FLOOD AFFECTED LAND FOR PLANNING PURPOSES.

LEGEND
Two-Dimensional Model Boundary
7.30 MIKE 11 River Chainage
Levee Route

NARROMINE RIVER BANK LEVEE FEASIBILITY STUDY

Figure 5.2

IMPACT OF ELEVATED RIVER LEVELS ON LOCAL DRAINAGE PATTERNS
POST LEVEE OPTION 2A(i) - 1% AEP